Railway Mechanical Engineer

July 1941

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National Defense the Center of Thought at

Mechanical Division Meeting

Discussions indicate far-reaching effect of priorities on new equipment — Reports on car construction, locomotive construction, lubrication, couplers and draft gears, brakes and brake equipment, and wheels all drew forth extensive comment

THE demands on the railroads of the national defense program and the measures which the railroads can take to insure that there will be no failure on their part to supply the needed transportation were the themes of several speakers who addressed the annual meeting of the Mechanical Division, Association of American Railroads, which was held at the Hotel Jefferson, St. Louis, Mo., June 19 and 20. The same thought was also in the background of the discussion of several of the eleven reports of standing committees which were presented during the meeting.

Presiding at the meeting where Chairman W. H. Flynn, general superintendent motive power and rolling stock, New York Central, and Vice-Chairman R. G. Hen-

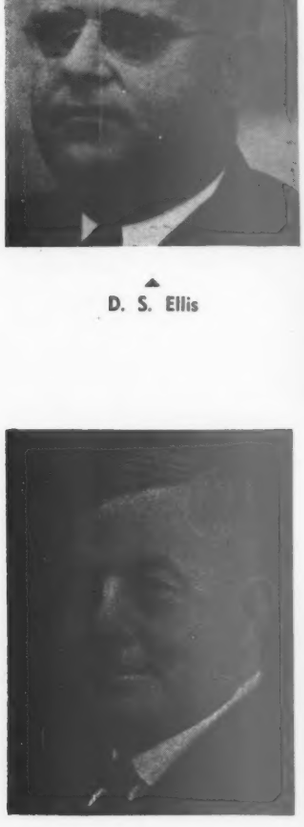
W. H. Flynn,
Chairman

R. G. Henley,
Vice-Chairman

V. R. Hawthorne,
Executive Vice-Chairman

D. S. Ellis

O. A. Garber



F. W. Hankins

J. Purcell

ley, superintendent motive power, Norfolk & Western. There was a total registered attendance of about 550 members and guests, of which about half were railroad men and half representatives of railway equipment manufacturers and supply companies. The principal address was delivered by L. W. Baldwin, chief executive officer, Missouri Pacific Lines, who appealed for more complete cooperation between railway departments in meeting the demands of the present emergency. Other speakers during the meeting were C. H. Buford, vice-president, Operations and Maintenance Department, A.A.R.; W. J. Patterson, member, Interstate Commerce Commission, and Roy V. Wright, editor, *Railway Mechanical Engineer*.

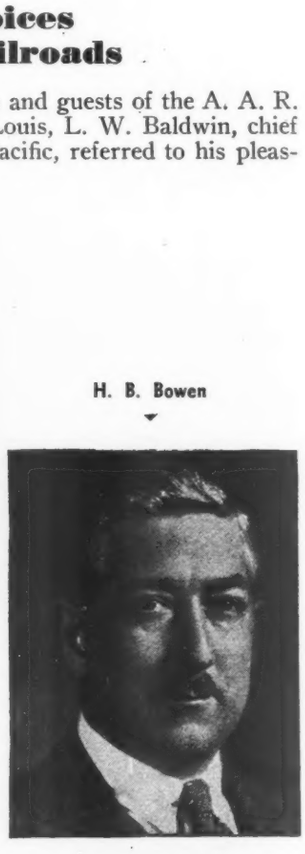
Five new members of the General Committee were elected to fill vacancies. These are H. B. Bowen, chief motive power and rolling stock, Canadian Pacific; E. B. Hall, chief mechanical officer, Chicago & North Western; H. H. Urbach, mechanical assistant to executive vice-president, Chicago, Burlington & Quincy; Geo. McCormick, general superintendent motive power, Southern Pacific, and O. Jabelmann, vice-president, Research and Mechanical Standards, Union Pacific. The terms of the chairman and vice-chairman are two years, and Messrs. Flynn and Henley will continue to serve until after the next annual meeting.

L. W. Baldwin Voices Confidence in Railroads

In welcoming the members and guests of the A. A. R. Mechanical Division to St. Louis, L. W. Baldwin, chief executive officer, Missouri Pacific, referred to his pleas-

G. C. Christy

H. B. Bowen



ant association with them of many years standing and that he could, therefore, talk to them not as strangers but as men who think and work along the same lines that he does. Mr. Baldwin expressed gratification at the accomplishments of the railways in recent strenuous years and said that the railways will meet and do all that is expected of them in the present defense emergency. Railroads have learned to do work better and get better materials and more production per man hour in repair shops than a decade ago. Efficient railroading is not magic but only plain common sense. As in every other business, he said, railroad men get out of their employment just what they put in.

Referring to the impression which many people seem to have, unfortunately, that the railroads cannot handle expected traffic peaks, Mr. Baldwin said that he does not believe this and that cooperation between railroads, shippers and manufacturers will produce the desired results. He said, for example, that the loading of cars to full capacity would be equivalent to 100,000 additional cars over night. He suggested the handling of railroad material also in full cars, the movements being made with as little delay as possible enroute and at terminals. He said he does not question the need for the new car program, but much can be accomplished by increasing the speed of car movement, loading and unloading.

Mr. Baldwin stressed the importance of putting the present ownership of cars in good condition for use, especially when this can be done at relatively little expense. For example, on one road, out of an average of 30,000 cars, a total of 6,500 cars were raised from B to A class

at an expenditure of $50 or less per car. Mechanical-department officers can also help by expediting car repairs and being sure that necessary repair materials are on hand before cars are taken out of service, which will increase the car supply at least five per cent.

With reference to motive power, Mr. Baldwin said that modern steam and Diesel locomotives have made a remarkable achievement from the point of view of increased reliability and efficiency in operation and that locomotive shop maintenance practices also have been substantially improved. He urged that neither locomotives nor cars be sent out on the road in such condition that they cannot make a successful trip. He urged the development of inspection methods sufficiently careful and comprehensive to assure this accomplishment. Mr. Baldwin said that cooperation must start with the staff officers who compare their mutual problems and take steps to make sure that all employees work together in harmony so far as possible.

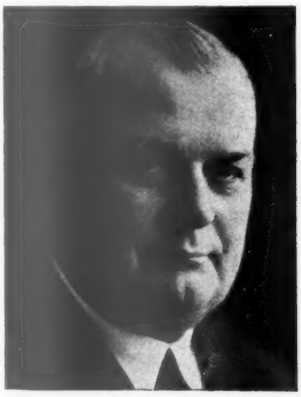
Railroads must do a thorough job in cooperation to promote the defense program of the United States. Mr. Baldwin suggested that every possible assistance be extended to the war industries and said that if the American railroads will cooperate in this objective, they will perform a service of which they may well be proud. He stated that in the present emergency railroads should forget competition and help other roads to supply necessary transportation. They should work together as they are now being more severely tested and more closely watched than at any time since the World war.

C. H. Buford Talks About Priorities

World conditions are changing rapidly and problems in this country are different from what we expected they would be even a few months ago. Our defense program started less than a year ago, and it cost four billion dollars in 1940. The expense is estimated at 17 billions for 1941 and at 23 billions for 1942. On top of this, we have the seven-billion-dollar lease-lend bill and about three and one-half billion dollars in British orders placed in this country. The need for transportation will increase. More transportation means more labor and material and it means a more intensive use of cars and locomotives.

Purchasing officers are now assembling information as to the amount of the various metals needed by the railroads for car and locomotive construction and maintenance. They will present this information to the Priority Division of the Office of Production Management at Washington, and will make every effort to get what you need, although they may not be able to get everything that you want. For example, it seems clear we are not going to obtain aluminum for the construction of new cars. We hope to get repair material needed for the units we now have. Other similar conditions will arise, and you will be advised promptly of the changes so you can make arrangements accordingly.

We have had difficulty in getting steel plates, shapes, and bars. Some railroad repair work has been delayed and some car construction has been shut down. This week action has been taken to solve this problem.



E. B. Hall

H. H. Urbach

G. McCormick

O. Jabelmann

A. C. Browning, Secretary

W. I. Cantley, Mechanical Engineer

Suggestions have been made that we explore the use of substitutes, and one of these is that we use wood instead of steel for the superstructure of cars. You probably know the answer before you investigate. In fact, I am sure that all of us who have been around cars for years have a fairly good idea of the answer. Regardless of how much we know or just what we think, we must make a thorough investigation, because the suggestion comes from high authority. If your study is thorough and your conclusions are sound, you will be in a better position to get the materials you need.

Under the stress of emergency, other suggestions may be made in the future. Some of these may come from people who are sincere but who know little of the service requirements or the details of your work. If any of these are referred to you, I urge that you handle them carefully and thoroughly and that you present the facts in as convincing a way as you can.

Do not let these new problems or questions disturb you and, above all, do not relax your endeavors still further to improve the standards and practices with respect to the equipment.

The Need for More Intensive Use of Equipment

I could spend hours telling you about the methods used for estimating prospective business and railroad capacity. After I had taken that much of your time, you would know as much as anyone else—and you would not have the answer. No one knows how many cars of freight will be loaded in any future week and no one knows the exact number of cars and locomotives. We can tell how many cars we have handled in the past, but that does not mean that more or less can be handled in the future. No fixed standard can be set because there are too many conditions that can change. The safe thing is to figure that there will be more business than we expect. Let us assume that there is so much business we will have to turn cars and locomotives faster than we have ever done before. We have passed through many years of transportation surplus. To pass from this condition to the other extreme which we have assumed suggests a little self- analysis and a look at our subordinate officers.

Have we older men let this period of transportation surplus create habits or practices that must be changed? Have our younger officers had most of their training during this period of surplus? We may have to change our way of doing things, and spend some time with our young officers to get them lined up. All this requires work. I doubt if we can do the job by writing letters. It will take personal effort and meetings to get things lined up. It will take continuous pressure to accomplish the desired results.

When heavy business is moving any road failure causes serious delay. It is important that units be carefully inspected before they leave terminals.

There is an old saying that "familiarity breeds contempt." Those who work with cars and locomotives must keep this in mind. Explore the possibilities of longer engine runs and other means of getting more service hours out of each locomotive. Do not let cars lie around waiting to be repaired. Load and unload cars promptly. Make regular checks and line up some plan so you will know personally that a real job is being done.

I suggest that you be neither pessimists nor optimists —just keep a straight course and deal with facts. Meet the situations that arise in the same cool, efficient way that you have in the past and, when all this noise about big business is over, you will see another record of a job well done.

Chairman Flynn's Address

The rapid expansion and tremendous acceleration of the National Defense Program has brought our railroads face to face with the problem of keeping ahead of the steadily increasing demand for cars and locomotives. Approximately 165,000 new freight cars of modern designs have been ordered by American railroads during the past 16 months to augment their existing equipment, and railroad freight-car repair shops are the busiest they have been in years. Reduction in the number of bad-order freight cars is progressing rapidly and it is imperative that the work continue with all speed.

Many new locomotives—steam and Diesel—of suitable capacity for the service required and thoroughly modern in design have been ordered, and the number of serviceable existing locomotives is, through extensive locomotive repair-shop operations, being steadily increased.

Passenger equipment cars have a very important place in the program of defense. While many new cars have been ordered, it is essential that the maximum possible number of existing cars be made ready for service and so maintained.

The greater dependability in service of cars and locomotives in use today, due to improvements in designs, materials, mechanical devices and standards of maintenance, in the bringing about of which the Mechanical Division has been actively engaged for many years, will be of material aid to providing the quality of transportation that is necessary.

A number of years ago the Mechanical Division appointed a Committee on Car Construction with directions to design standard cars which would be acceptable for general use. Resulting from the excellent work of this committee, and in which valuable assistance was rendered by the American Railway Car Institute representing car manufacturing companies, highly satisfactory designs for several types of cars have been produced. Many thousands of cars have been built from these designs and practically all box and hopper cars now being built are substantially in accordance therewith. In emergencies like the present when freight cars of standard types must be built in volume, the availability of these standard designs greatly overcomes delays incidental to development work in engineering of details and greatly facilitates obtaining the material required in construction.

Designs of new steam locomotives incorporate many improvements tending to insure greater reliability and more efficient performance, with a decrease in engine-terminal maintenance and an increase in availability. Longer range in operation where possible is being obtained by the application of tenders with greater coal or greater water capacities, or both. The development and extent of use of Diesel-electric locomotives are also progressing very rapidly.

Since the last meeting of the division much needed assistance in the handling of the many important matters coming before it for immediate attention has been provided in the creation of the office of executive vice-chairman. V. R. Hawthorne, secretary for nearly 22 years, was appointed to this new position, and A. C. Browning, assistant secretary also for nearly 22 years, was appointed secretary.

At the last meeting of the division you approved the adoption of new or revised loading rules without their submission to letter ballot. As will be brought out in the report of the Committee on Loading Rules, this has proved to be a great aid to the committee and with distinct advantage both to the railroads and the shippers.

Remarks by Commissioner Patterson

At the closing session of the meeting, W. J. Patterson, member, Interstate Commerce Commission, expressed his commendation to the committees for preparing the fine reports. He took exception, however, to a few specific items included in some of the reports, one of which was the conclusions reached by the Committee on Brakes and Brake Equipment with respect to the cleaning of AB brake valves equipped with strainers of improved design, which stated the three-year cleaning period was not only feasible but could be further extended. He was of the opinion that the three-year period allowed by present regulations might be too long. The AB valves tested, he continued, did not have high mileage nor were they subjected to severe atmospheric conditions.

Mr. Patterson commented on two public notices sent out by the Interstate Commerce Commission; one proposing a modification of Rule 23 (b) relating to tell-tale holes in flexible staybolts, the other modifying the rule on footboards of steam switching locomotives to permit a test application of a fabricated metal footboard. The modification to Rule 23 (b), he stated, will be placed in effect unless criticism is obtained, none having been received to date. He called particular attention to the modification of the rule governing footboards as the test application was to be made to only one Erie switching locomotive at Buffalo, N. Y. He requested the Mechanical Division to watch the performance of this test application during the authorized period which expires July 1, 1943.

The last item referred to by Mr. Patterson was the specifications for geared hand brakes. What means, he asked, is being used by the Mechanical Division to insure that these hand brakes meet the specifications? He thought it was important to test the geared hand brakes in order to make sure they complied with the requirements of the A. A. R. specifications.

Remarks by Roy V. Wright

In a brief address, Roy V. Wright, editor, *Railway Mechanical Engineer,* stressed the seriousness of the task with which railway men will be faced during the coming months. He opened his remarks with a reference to the grim determination evidenced by the various members of the Canadian government in a recent conference with a group of business paper editors from the United States and compared their unquestioning confidence in the outcome with that expressed by L. W. Baldwin.

Mr. Wright emphasized the importance of giving careful attention to the little things concerning which Mr. Baldwin had spoken. He suggested that if each repair yard, each shop, and each enginehouse were to do a little better, the cumulative effect would exert a large influence on the total transportation result. He suggested that the beating of its own record might well be made a game at each of these points all over the United States. Among the things he stressed particularly were the better utilization of existing equipment and materials and the development of more leadership in directing men.

Mr. Wright concluded his remarks with a strong appeal for stubborn courage in facing the difficult times ahead which, he said, was necessary if we are to win a victory for private enterprise and the American type of democracy.

Report of the General Committee

The General Committee reviewed the work of the Mechanical Division and its actions since the last annual meeting of the Division at Chicago in June, 1940. The membership of the division was reported to include 212 railway systems, full members of the Association of American Railroads, and 179 railways, associate members of the Association of American Railroads. These 391 railroads have appointed 818 representatives in the Mechanical Division. There are also 405 affiliated and 345 life members in the division.

As of December 31, 1940, the committee reported, a total of 443,484 interchange freight cars, or 22.17 per cent, were equipped with AB brakes. Of this total 411,672 were railroad-owned and 31,812 were private-line cars. AB brakes were reported as now being applied to existing cars at an accelerating rate.

The committee also reported that the service of the A. A. R. auto-deck has been entirely satisfactory in extensive tests with a large number of automobiles of various makes which have been followed through to destination.

A Study of Locomotive Utilization

The General Committee announced that the joint committee of the Operating-Transportation and Mechanical Divisions on the Utilization of Locomotives and Conservation of Fuel has undertaken a study of all of the conditions related to this subject, that a working sub-committee has been appointed to conduct the study and that a preliminary questionnaire has been sent to the member lines.

Research Office

The report reviewed the work of the mechanical engineer and his staff during the past year in which he has carried out a number of research projects assigned by the General Committee and has assisted in the work of the regular standing committees of the division.

Among the projects handled during the past year and being handled at the present time are the following:

Axle tests: material specifications for passenger cars; axles for heavy-duty service; tubular axles.
Trucks for high-speed freight service.
Counterbalance standards for locomotives.
A. A. R. auto deck.
Investigation of helical springs for freight cars.
Refrigerator Cars: effect of light cracks; use of dry ice as a refrigerant; use of portable refrigerator containers.
Wrought steel wheels; thin hub wall; reduced mounting pressures.
Tests for Committee on Loading Rules: tests of high tensile bands and wires; tests of welded band anchors.
Assisted in investigations in connection with concentrated loads.
Assisted in tests and preparation of rules governing loading of motorized and mechanized equipment for the U. S. Army.
Investigation of the characteristics of steel at low temperatures, particularly, couplers.
Cooperation with the Joint Committee on Relation between track and equipment.

Tests of crank pins will be started about July 1, 1941, at the axle testing laboratory, located at Canton, Ohio. The axle fatigue testing machines will be adapted for use in this research program.

Since the first of this year, this office has witnessed the squeeze tests of four new designs of passenger cars built to the A. A. R. Specification for New Passenger Equipment Cars.

Counterbalance tests of locomotives, together with rail stress tests, will be conducted during this summer in cooperation with the Engineering Division. Instruments to be used in these tests have been ordered and it is expected that the tests will be started about July 1, 1941. These tests will be under the general direction of the Joint Committee on Relation between Track and Rolling Stock of the Engineering and Mechanical Divisions and the Committee on Counterbalance Standards of the Mechanical Division and under the direct supervision of the Mechanical Engineer of the Mechanical Division and the Research Engineer of the Engineering Division. These tests will be concluded this summer and report will be available about the first of the year 1942.

Tests of tracking characteristics of various designs of freight car trucks, together with side bearing conditions, will be conducted this year under the general supervision of the Committee on Car Construction.

Report on Lubrication Of Cars and Locomotives

Dust Guards

In the 1939 annual report of the committee, a suggestion for revision of Specification M-903-34; Dust Guards, was included with recommendations that it be circularized among the members of the Association with a request that suggestions or criticisms be submitted for further study by the committee. This was done and the comments received through the secretary's office were considered, along with representative samples of dust guards on the market collected by them for study and test.

Recommendation: By action of the Lubrication Committee, concurred in by the Specifications Committee, a proposed revision of Specification M-903-41 Dust Guards, was made a part of this Report as Appendix A, and it was recommended that it be submitted to Letter Ballot.

Interchange Rule 66

Mandatory Features Relating to Lubrication—During the year, a number of subjects relating to proposed changes or additions to clauses of Rule 66, were referred to and handled by the committee as follows:

(1) *Standard method of packing journal boxes—Present "one-piece" vs. "roll" method.* This subject was continued from last year with the intention to carry on road tests under the direction of a sub-committee. After very careful consideration by the committee it was concluded that there is little difference in results obtained, providing comparable material is applied and equal care is taken with respect to the packing operation. It was decided that limited service tests would be inconclusive. The committee recommends no change in the present rule which leaves the method employed optional by designating that packing should be applied "preferably in one piece" (Par. 10(b)—Body of Packing).

(2) *Hollow back journal wedges—Removal from service when non-defective—Wear limits.* (The report of the sub-committee on hollow-back journal box wedges appears below.—EDITOR.) The Lubrication Committee advised the Arbitration Committee that the committee "sees no objection to individual car owners wearing out hollow-back or corrugated journal-bearing wedges under their own cars," inasmuch as the rules already prohibit their application in repairs to foreign cars.

It is recommended: (a) That the rules be so construed, and that wedges be not condemned merely because they are hollow back, unless defective under the provisions of Rule No. 66 (k).

(b) That the second sentence of Paragraph 12 of Section of Rule 66 covering "Journal Boxes—Standard Method of Packing," reading: "The use of hollow back or corrugated back wedges is not permitted," be deleted. This sentence is unnecessary, as Interchange Rule No. 19 covers.

(3) Recommendation to prohibit use of front plug in packing of Journal Boxes. The Car Department Officers' Association, at its 1940 annual meeting, recommended to the A. A. R. Mechanical Division that the use of the front plug in packing journal boxes be prohibited. This recommendation was referred to the Committee on Lubrication of Cars and Locomotives for handling. After full discussion, it is the consensus of opinion of the committee that the present Rule, which makes the practice optional, is desirable and should be continued.

Subcommittee Report on Hollow Back Journal-Box Wedges

The subcommittee reviewed a number of hollow-back wedges removed from Pennsylvania freight cars in service, as well as wedges of various designs, having hollow backs, removed from cars of other railroads and car lines. A list of wedges examined, was included in the report and photographs of representative types are shown.

Most of the so-called hollow-back wedges are forgings, and in a few cases steel castings, with depressions in the back. There are also still in service a number of U. S. R. A. cast wedges with cored backs, but which have the external contour of an A. A. R. standard wedge. These wedges were originally applied to the freight cars built in the years 1919-20 by the United States Railroad Administration.

The subcommittee recommended the following reply to the secretary concerning the submission from the Arbitration Committee:

"The Lubrication Committee sees no objection to individual car owners wearing out hollow-back or corrugated-back journal bearing wedges under their own cars, inasmuch as the rules already prohibit application in repairs to foreign cars. We recommend that the rules be so construed, and that such wedges should not be condemned merely because they are hollow back, unless defective under Rule 66-K."

Passenger Equipment Cars—Rules PC-7 and PC-8

(1) *Responsibility for damage due to failure of roller bearing units under passenger cars.* The Arbitration Committee's recommendation for revision of passenger car Interchange Rules 7 and 8, to provide that the failure of roller bearing units, or combination roller bearing units and friction bearing units, due to defects or over-heating, will be classified as car owner's responsibility, was concurred in by the Committee on Lubrication of Cars and Locomotives.

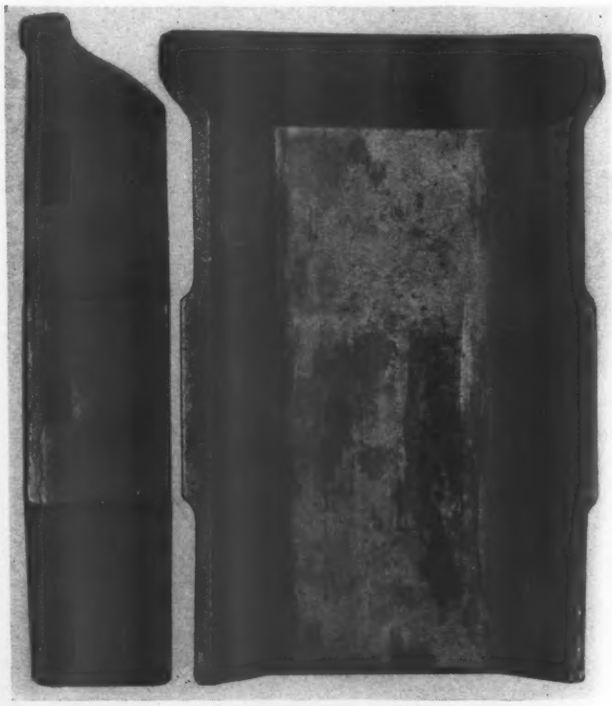
Lubrication of Railway Roller-Bearing Equipment — Lubricants and Practices

At the present time there is a wide variation in the specifications of the numerous oils approved or recommended by the roller bearing manufacturers, and even for use on the same bearings on different railroads. The committee feels that a general specification for oils for roller bearings is desirable and will endeavor to include this in the report for next year.

Special Journal-Box Lubricators

This subject has been before the committee for a number of years and was last reported on in the 1939 annual report where specific reference was made to engine truck journal lubricators and a number of special lubricators were described and illustrated. In an endeavor to keep abreast of new developments in this field, correlate the results of service test or experience reported by member roads, and make report from time to time as developments in the field warrant, the subject this year was assigned to a sub-committee. The sub-committee reports:

"One member road has had limited satisfactory experience with a journal lubricator pad not heretofore mentioned in reports of this committee. This is a spring actuated pad, adaptable for



A hollow-back journal-bearing wedge of U. S. R. A. design

use in existing journal boxes and can be applied or removed without removing the bearing or the wedge. This pad was designed with the idea of reclamation or cleaning for reuse and it is claimed that the coil spring laid in a horizontal direction exerts constant pressure of very low magnitude against the journal.

Joint Sub-Committee on Journal-Box Lubricating Materials

A joint sub-committee consisting of membership from the Specifications and the Lubrication Committees has handled two matters during the year.

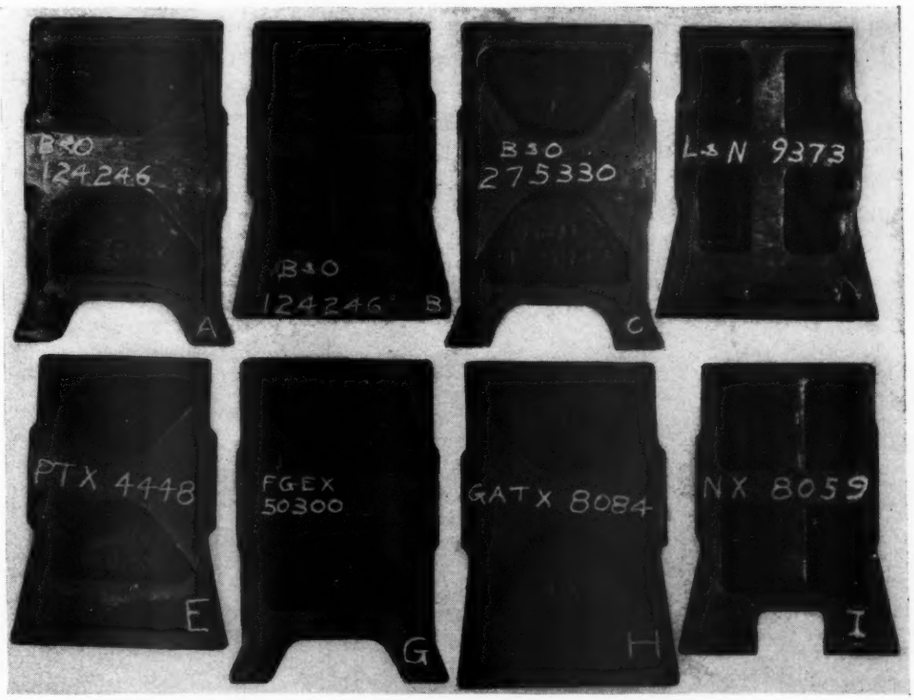
Proposed Revision—Specification M-905

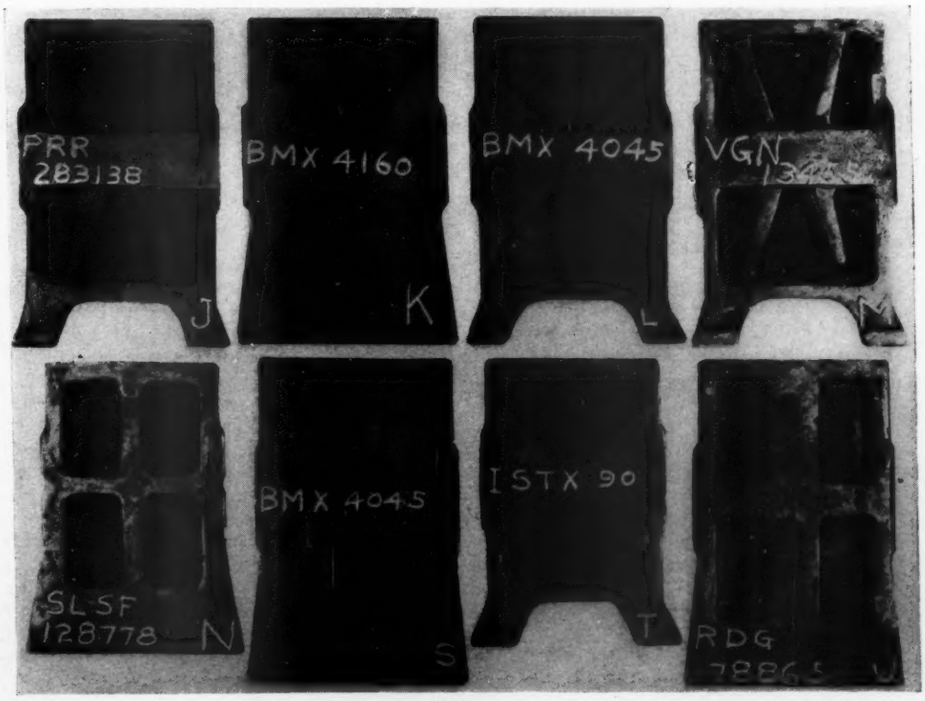
At the suggestion of the chairman of the Committee on Specifications for Materials, revision of Specification M-905-34 was undertaken by the joint sub-committee.

Recommendations: By action of the Specifications Committee, concurred in by the Lubrication Committee, proposed revision of Specification M-905-41; New Waste for Journal Box Packing. [This was made a part of the report and it was recommended that it be submitted to letter ballot.—Editor]

Proposed Specifications Covering Lubricants for Air-Brake Apparatus

Specifications for triple valve oil, triple valve graphite and brake-cylinder lubricant: originated by the Committee on Brakes and Brake Equipment, were referred to the joint sub-committee through the Specifications Committee.





Recessed - back journal - bearing wedges removed from various cars

Recommendations: Action of the Specifications Committee, concurred in by the Lubrication Committee, on the proposed specifications for Lubricants; Air Brake Parts, was as follows:

1. Specification M-912-41; Triple-Valve Oil, approved with the recommendation that it be submitted to letter ballot.

2. Specification M-913-41; Triple-Valve Graphite, approved with the recommendation that it be submitted to letter ballot.

3. Specification M-914; Brake-Cylinder Lubricant: A draft of the proposed specification, submitted by the Joint Sub-Committee, was referred back to the Joint Sub-Committee for further study and report.

Diesel-Locomotive Crank-Case Lubrication—Lubricants and Practices

This subject has been assigned to a sub-committee for study this year and, through a questionnaire to be sent out to the locomotive voting members, the sub-committee hopes to develop material for a report on this subject next year.

Joint Sub-Committee on Journal Boxes and Contained Parts

A joint sub-committee consisting of membership from the Car Construction and the Lubrication Committees, has made some study of several details in connection with modification of parts of the journal-box assembly: box, wedge, and bearing. A number of the changes relating to the question of lubrication have been considered by the Lubrication Committee or its representatives on the joint sub-committee. In all cases, however, the proposed modifications involve dimensional changes and design of parts which come under the jurisdiction of the Car Construction Committee and will be handled by that committee.

The report was signed by J. R. Jackson (chairman), engineer of tests, Mo. Pac.; P. Maddox, superintendent car department, C. & O.; A. J. Pichetto, general air brake engineer, I. C.; L. B. Jones, engineer of tests, Pennsylvania; W. G. Aten, mechanical inspector in charge of lubricating matters, C. B. & Q.; J. Mattise, general air brake instructor, C. & N. W., and J. W. Hergenhan, assistant engineer, test department, N. Y. C.

Discussion

In presenting this report, Chairman Jackson said that, owing to the existence of a certain amount of hazard in connection with the Sligh oxidation test for triple valve oil, referred to in Exhibit B, Sec. 4, a precautionary clause designed to eliminate this hazard is being included. He said that under Specification M-914, in no case should either alcohol or ether be used in cleaning air brake valve parts.

J. McMullen, superintendent car department, Erie, called attention to the necessity for high-speed movement of freight cars without delays due to hot boxes which, assuming an average of 30 minutes for each, appreciably reduce potential transportation service. Mr. McMullen referred to tests which the Erie is conducting with a special journal bearing in which the babbitt lining is interlocked with the bronze back and suggested the more extensive use of this bearing with a view to eliminating hot boxes due to loose or flowing journal brass linings.

P. P. Barthelemy, master car builder, G. N., voiced objection to hollow-back wedges and asked if any study has been made of flame hardening.

In answer to the first question, Mr. Jackson replied that the committee's recommendation was made with a view to conserving material and that some of these wedges have been in service for as long as 20 years without trouble. He said that the flame-hardening of wedge bearing surfaces would in all probability cause excessive wear in the journal box roofs.

H. W. Coddington, chief chemical and test engineer, N. & W., said that loose journal-brass linings may possibly be due to imperfect bonding, and mentioned a machine which has been developed on the Norfolk & Western for actually measuring the bond strength between the brass body and the lining metal. As a result of the use of this machine, the N. & W. journal-brass specification calls for a definite bonding strength and has helped increase the number of miles per hot box. Mr. Coddington said that he would make available to the Mechanical Division committee data regarding flux material which has been found to give good results.

J. E. Mehan, assistant to superintendent car department, C. M. St. P. & P., called attention to the omission of any reference to dust-guard plugs in the committee's specification and Mr. Jackson said that this does not imply elimination of dust-guard plugs which are amply covered in Interchange Rule 66.

E. B. Hall, chief mechanical officer, C. & N. W., asked why no mention was made of defective oil-box covers and Mr. Jackson replied that improvement in this detail of design is a responsibility of the Committee on Car Construction, but his committee will also be glad to give it consideration in the coming year, if it is found desirable.

C. D. Stewart, chief engineer, Westinghouse Air Brake Company, said that a comprehensive brake-cylinder lubricant specification is necessary to assure adequate lubrication for a long period and that this same lubricant obviously should be used at repair points. Recalling that Type-K freight triple valves were originally designed for 12 months' operation without lubricating attention, this period being subsequently extended to 18 months, Mr. Stewart said that the Type AB equipment is aimed at three years' service. Practically complete protection from dust and dirt assures low friction during this period and the type of lubrication selected is designed to last for at least 36 months. He said that laboratory tests have shown the adequacy of the Sligh method of testing triple-valve oil.

The report was accepted.

Brakes and Brake Equipment

Elimination of excessive leakage of air from the brake pipe has for many years in the past, and is continuing to be, of paramount importance to the operation of and proper control of brakes on freight trains. Experience has indicated that a considerable amount of brake pipe leakage occurs at the air hose couplings.

Our 1937 annual report showed a picture of and suggested the use of an air hose coupling testing device for submerging the coupling under water and testing before mounting it on the hose. Since that report was made there has been considerable more work done with this device. There have been a number in service for several years and the results have been very gratifying.

Instructions for Use of Testing Device for Air-brake Hose Couplings

When a coupling is cleaned and ready for test, try to apply it to the no go gage which can be rigidly attached to the corner of the tank. If the coupling will go on this gage, it must be rejected.

If the coupling will not go on the gage, apply the combined go gage and dummy coupling to it. If the coupling refuses to take this gage freely, it must be rejected.

With the combined gage and dummy coupling applied, place the coupling nipple shank in the chuck which will be locked in its upper position by the latch on the handle engaging the bead on the rim of the tank, and move the holding hook of the chuck into engagement with the coupling stop pin. The exhaust cock will then be closed and the supply cock opened so as to connect air pressure at 70 lb. to the chuck. The air pressure will then register on the gage, cause the chuck to grip the coupling shank with an air-tight fit, and be connected to the inside of the coupling.

Then examine the coupling for audible leaks, unlatch the handle, rotate the chuck until the coupling is submerged. Bubbles will indicate leakage which can be located by slowly raising the coupling to the point of leakage.

If leakage occurs at the gasket groove, remove the gasket and make certain the groove and gasket are clean and then retest. If the leakage persists, the coupling must be rejected. If leakage occurs as a result of porosity of the coupling casting, it may be lightly peaned. If the leakage persists, the coupling must be rejected.

Couplings should be free from leakage but they need not be condemned for minor leakage as disclosed by bubbles that develop very slowly. In such cases, close the air supply cock and observe the air pressure gage. The leakage must not exceed a drop of 4 lb. from 70-lb. pressure in one minute.

We believe that the use of the above device will eliminate the leaking couplings from service, before they are mounted on the hose, thereby greatly reducing ever present brake pipe leakage,

assist in the reduction of train delays and produce better control of train brakes.

We, therefore, recommend the adoption of this device as recommended practice.

Modification of Freight Retaining Valve

New Slow-Release Retaining Valve

The 1940 annual report contained a brief reference to the redesign of the freight retaining valve in order to provide additional protection and variable control of brake cylinder pressures. During the past year further study has been made of the new four-position Slow Release Retaining Valve for freight service.

This new slow-release retaining valve has four positions instead of three. Three of the positions, however, produce exactly the same results as the present A. A. R. standard retainer, that is—direct exhaust with handle in the vertical or down position; high-pressure retain (nominal 20 lb.) in the 45-deg. position; and low-pressure retain (nominal 10 lb.) in the 90-deg. or horizontal position. The fourth position is with the handle at 45 deg. above the horizontal and known as slow-direct-exhaust position. In this position the brake cylinder is connected to atmosphere through a No. 60 drill orifice which permits the normal cylinder volume to blow down from 50 lb. to 10 lb. in approximately 86 sec. and will continue to exhaust until the brake is completely released without turning down the retainer.

The road service tests disclosed that the No. 60 drill orifice provides a sufficiently slow release to avoid harsh train slack movement when releasing the brakes on comparative long trains while in motion.

In addition to the new fourth position and its operating feature the new retainer has certain desirable constructional features such as: (a) The bracket is arranged for permanent mounting to the car body with the valve body bolted to it so that the valve can be easily removed for cleaning or repairs without disturbing the pipe connection. (b) The valve is protected from pipe scale and dirt by a readily renewable strainer and (c) The exhaust ports are protected from wasps entering the valve by a wasp excluder built into the body.

This valve retains all of the features of the present A. A. R. standard and, in addition, includes a fourth position giving a continuous blown down of brake-cylinder pressure to zero pressure for the purpose of providing means for accomplishing improved control of the slack action of freight trains during release of train brakes while in motion, which will result in outstanding operating economies in time and cost, indicated by the following:

(a) Decrease frequency of stoppng trains to set up and turn down retaining valves under certain now existing operating conditions.

(b) Decrease frequency of stopping trains to release brakes at lower speeds than is now common practice.

(c) Decrease damage to equipment and lading resulting from improved train slack control when releasing brakes on maximum long trains in *level* grade operation.

(d) Accomplish smooth train slack control on generally descending and perhaps undulating grades which may contain sections of adverse grades and without changing the retaining valve setting between terminals.

We recommend that the new four position slow release retaining valve be adopted as recommended practice.

Modification of Present Standard Retaining Valve

If the above recommendation is favorably received, the present A. A. R. Standard Retainer can be readily converted to include the fourth position with the same advantages as above outlined. [An outline drawing and diagrammatic of a standard retainer modified to include the slow-direct-exhaust position as well as a wasp excluder and vent protector was included in the report.—Editor.]

We recommend that this conversion be adopted as recommended practice for present equipment, provided the above recommendation for new cars is adopted.

Wasp Excluder and Vent Protector

In our annual reports of 1939 and 1940 reference was made to an improved design of wasp excluder, for the present retaining valve, in which complete protection is provided against mud-wasps restricting or completely plugging the exhaust ports, together with complete protection against ice, sleet or other elements, thus avoiding wheel damage and improper release of the brakes.

We also made reference to a molded rubber sleeve to fit over the low pressure cap of the retainer as a means of overcoming wheel troubles caused by moisture entering the valve, causing corrosion and stopping up of the small relief part.

We now wish to report that as a result of our investigation and observations of those in service we recommend the use of this type of vent port protector and the rubber-disc type of wasp excluder in lieu of all previous types submitted.

Cleaning, Testing and Lubricating of AB Valves

During the past year we have made very extensive tests and inspections of 100 Pennsylvania cars and 100 Santa Fe cars that were equipped with AB Brakes and marked "AB Brake—Experimental," having the improved types of bracket strainers.

The average service period of the 200 cars involved was 43 months. The results of the tests and the condition of the valves and equipment as a whole were very gratifying. Tests of complete trains of 100 cars each made before the equipment was disturbed, but as represented by an average service period of 43 months, revealed proper operation after light and heavy service applications and emergency applications as well as the releases.

On rack tests and visual inspection it was revealed however, that there was some restriction of the service portion feed grooves and the quick action chamber charging chokes. We concluded from the results, however, that the present three year cleaning period is not only entirely feasible with valves equipped with the improved strainers, but could be further extended.

Our complete report on this subject with definite recommendations has already been submitted to the General Committee for their consideration.

Standard Brake Beam

Your committee has been making a study of the detailed causes of brake-beam failures and after compiling the data taken from reports of over 34,000 beams removed on various railroads it is interesting to note that worn heads comprise 47.4 per cent of the removals, 26.35 per cent tension rod defects, either broken, bent or loose rods or nuts missing. The other 26.25 per cent miscellaneous defects. The three outstanding defects for beam removals are brake head worn at toe, 15.47 per cent; brake head worn at center lug, 13.9 per cent, and tension rod broken at thread, 13.84 per cent.

We are not in a position to make a definite recommendation in connection with this subject, but it is very evident that drastic action must soon be taken to curb brake-beam failures.

Passenger Car Steam Connectors

The report includes a drawing showing the dimensions for the 2-in. passenger-car steam coupler head similar to that now shown as standard on page 78 of Sec. E of the Manual, except for the addition of grooves to the head to make same suitable for interchange of either the Vapor Car Heating Company's or the Gold Car Heating and Lighting Company's gaskets which employ different methods of locking same in coupler head. The committee recommends the substitution of this figure showing these grooves in place of present page 78 of Sec. E. of the Manual as Standard.

Emergency and Service Pistons for AB Brakes of the Self-Lubricated Type

In order to provide proper lubrication of the service and emergency pistons of the AB valve over extended service periods a considerable amount of development work has been done with a self-lubricated type of piston. This piston contains an oil chamber with a capacity of approximately 300 drops of oil, which is fed to the piston ring and ring groove in very minute quantities.

There have been a limited number of pistons of this type in service for more than two years and the results have been very encouraging.

The air-brake manufacturers have expressed their willingness to absorb the extra cost involved to make the AB valve with self-lubricating pistons available at no increase in price over the AB valve with the present type of pistons, for all new valves

manufactured after a given date, due to the fact that certain reductions in manufacturing cost have been made possible by the elimination of the by-pass check valves and their related parts. The air-brake companies also have stated that the development work and experience which they have had allows them definitely to recommend the use of these pistons and are willing to insure their proper operation.

Inasmuch as your committee has already recommended that authority be extended to permit the use of these pistons to all roads which desire such equipment without limitation; due to the fact that the self-lubricated piston can always be operated the same as the present piston, simply by the removal of the oil, if the occasion should demand; and due to the above assurance and statements made by the air-brake manufacturers, we wish to recommend the adoption of the self-lubricated type of service and emergency pistons in all AB valves manufactured after a certain date, which date should be the earliest practical date that the manufacturers can get in production.

Both air-brake companies are prepared to furnish a common standard for new valves.

We are also studying the possibility of converting the present pistons which are in service to pistons of the self-lubricated type, but to date we can offer no definite recommendations for this conversion.

Different length piston stops are required with the AB test rack when testing portions equipped with self-lubricated pistons than when testing portions with standard pistons.

Use of Hollow Type Plugs

It has been brought to our attention that there have been cases of train delays and damage to equipment resulting from emergency applications caused by some flying object from the roadway striking the pipe plug applied in the bottom of the Type K triple valve. These were the hollow type pipe plugs instead of solid type.

We were advised by the air-brake manufacturers that they have been for some years, and are now using solid type pipe plugs.

We recommend the use of a solid type pipe plug when a pipe plug is used on any part of the air brake equipment and any of the hollow type now in service to be replaced with the solid type.

Excessive Wear in AB Valve Release Handle

The hole in the reservoir release valve handle of the AB valve for the insertion of a cotter pin to secure the release rod is a 9/32-in. drilled hole. It was the intent when providing this size hole that a ¼-in. cotter pin was to be used at this point. It has been noted that a considerable number of 7/32-in. cotter pins and some 1/8-in. cotter pins are being used for this purpose rather than the ¼-in. which practice allows movement due to vibration and causes excessive wear of the handle and cotter pin.

It is recommended that ¼-in. cotter pins only be used at this location and that all valves in service having smaller than ¼-in. be replaced when they are on repair tracks.

Combined Dirt Collector and Cut-out

Difficulties have been encountered in operating the branch-pipe cut-out cock in the combined dirt collector and cut-out cock of the AB brake equipment, due to high friction between the plug cock and the body. The high friction is caused by the accumulation of rust and the infrequent number of operations.

Tests made on 200 cars revealed that a pull of over 360 lb. was required near the end of the cut-out cock handle on 18 cars to start movement. On the remaining 182 cars an average pull of approximately 133 lb. was required, which is considered to be in excess of the pull capable of being exerted at this point by an average man. The resistance to start of movement is approximately 45 per cent higher for those units on refrigerator cars than for those on box cars.

The cast-iron body of the present standard unit forms the seat for a brass plug with an enlarged water-way. The manufacturers of this unit have found it possible to equip the standard body with a brass bushing forming the seat for a smaller plug but with sufficient size water-way so that there is no detrimental effect on the performance of the complete brake equipment.

The use of the brass brushing to prevent such corrosion as was present with the cast-iron seat and the reduction in radius of the plug with the same length handle will without a doubt reduce the pull required to start the movement of the cut-out cock and should correct the difficulties encountered.

We have approved this new design of combined dirt collector and cut-out cock for use in interchange as a permissible substitute for the present standard. If further experience proves the adequacy of this unit we shall then, no doubt, recommend its use as standard.

The report was signed by R. E. Baker (chairman), general supervisor of air brakes, air conditioning and power plants, B. & M.; J. A. Burke (vice-chairman), supervisor of air brakes, A. T. & S. F.; W. H. Clegg, general superintendent of motive power and car equipment, G. T. W.; T. L. Burton, air-brake engineer, N. Y. C.; C. H. Rawlings, superintendent of air brakes, D. & R. G. W.; R. J. Watters, general air-brake inspector, Nor. Pac.; Otto Swan, air-brake instructor, U. P.; J. P. Lantelme, general foreman, Pennsylvania; J. Mattise, general air-brake instructor, C. & N. W.; R. E. Anderson, general air-brake inspector, C. & O., and R. N. Booker, general air-brake inspector, Sou. Pac.

Discussion

E. B. Hall, chief mechanical officer, C. & N. W., complimented the committee on its report, but said that it fails to mention a number of things which cause a lot of delays on railroads, such as improper anchorage of brake pipes.

W. E. Vergan, supervisor of air brakes, M-K-T, said that he is in favor of the hose-coupling test device, described in the committee's report, which will lessen the time required for testing, as compared with the device submitted in 1937. He suggested that the use of the improved device be made mandatory instead of recommended practice. Referring to the modification of the retaining valve, Mr. Vergan said that the choke feature should be made available quickly and easily by simply turning a retaining valve handle, thus enabling trainmen to secure maximum benefits in operation. Mr. Vergan stated that slack action can and should be controlled now, not only in long trains but in short trains, especially those operating over hilly country where slack has a tendency to run in and out. He is in agreement with the balance of the committee's report but feels that the Type AB equipment should be good for five years without intermediate inspection and lubrication attention.

In closing the report, Chairman Baker said that the committee is studying the question of proper pipe-clamp design and, in response to a comment by I. C. Bond of the Wabash, regarding the superiority of the No. 3 brake beam with 1⅜-in. rods, said that the committee is also giving consideration to the subject of improved brake-beam performance in conjunction with a committee representing the manufacturers.

The report was accepted and recommendations ordered submitted to letter ballot.

Couplers and Draft Gears

No new certificates of approval for draft gears have been issued during the past year, and the number of approved gears remains at twelve. These are made by six different manufacturers. Two of these approvals are conditional, which signifies that they cover new designs of gears whose service performance will be watched in order to see if unconditional approval is merited.

The two year period for conditional approval has expired for the Waugh-Gould Type 410 gear. No action has been taken to change the status of this gear, since the manufacturer advises that there have been only five of them sold. One of the purposes of conditional approval is to exercise some restraint on the number of gears of a new and untried type which might be placed in service, so that if some defect shows up which the laboratory did not reveal, there will not be an undue burden placed on the railroads.

It has been found that manufacturers desire to maintain unchanged the type designation of an approved gear if an improvement is made, this for the purpose of avoiding the disadvantage of a lower interchange price if the former designation is placed in the non-approved classification. Obviously a bad situation would be created for the railroads if gears of different construction were permitted to retain the same type designation. On the other hand, the Committee feels that everything possible should be done to encourage the manufacturers to make improvements

in existing approved gears, and there should be no penalty imposed on any manufacturer who does this, or on his customers. In order to overcome this difficulty it is proposed to establish a new classification for approved gears, to be designated as "Superseded Approved Gears." If modifications are made in an approved or conditionally approved gear, a new type designation will be required and the former type designation will be placed in the "Superseded Approved" classification. Gears in this classification will have the same interchange status as "Approved Gears" and will remain in this classification until they become obsolete.

The manufacturer of the Peerless H-1 gear made application for approval of a change in the housing construction, this change consisting of the addition of ribs on the outside of the housing to facilitate substitution for other types of gears in interchange repairs. Subsequently a second application was made covering a change in the design of these ribs, after the first design had been approved without requiring any tests to be made. Suggestions have been made concerning this second design of ribs, and when these are complied with this change will be approved.

The manufacturer of the Westinghouse NY-11-E and NZ-11-E gears has made application for approval of new designs of housings for these gears. These new designs will give housings weighing less which it is claimed are stronger than the previous housings. Since the new housings involve no change in the friction parts of the gear, it has been decided that their suitability can be determined by subjecting three gears of each type to the preliminary, capacity and sturdiness tests. This will be done as soon as test specimens can be obtained.

Check Tests of Approved Draft Gears

During the year a partial retest of one approved draft gear was made in accordance with decision reached after the series of check tests referred to in the report for the past two years. As a result of this retest the certificate of approval was reissued to cover changes that had been made in the manufacture of the gear.

A second type of gear was required to undergo a complete new approval test as a result of its showing in the previous check test, and the manufacturer has filed his application for this new test. Before supplying test specimens he desires to check the effect of modifications in design by making private tests under the Association's drop hammer, and this work has been going on practically continuously since last July. Latest advice is that the manufacturer is about ready to proceed with construction of a lot of gears embodying the newest features, and when these are ready test specimens will be selected.

A new check test of approved gears has been conducted during the past year. The first check test was made on seven types of gears, the other five types of approved gears being omitted either because of their similarity in design to a type included or because they had just recently been approved. Five of these seven types of gears were included in this second check test, the other two types getting special treatment as referred to in the two paragraphs above. The gears included in this second check test, known as the 1940 Check Test, consisted of the following types: Edgewater B-32-KA; Miner A-22-XB, Cylinder D-7935; National M-17-A; Waugh-Gould 403; Westinghouse NY-11E.

Three gears of each of these types were selected from stock at the manufacturer's plants without advance notice being given when selection was to be made. It was quite noticeable that these gears were superior to the gears secured for the 1938 check test. The parts of the gears were in closer conformity with the manufacturer's drawings which are on record, and the workmanship was better. This was probably a result of the criticisms made after the last test. The gears were in better shape as regards the condition of the friction surfaces, which would be expected from gears taken out of manufacturer's stock. Each of the five gears tested complied with specification requirements in all essential respects, in fact, the performance of the gears in these check tests was in only a few respects less satisfactory, and in some respects more satisfactory, than in the official tests upon which original approvals were based.

Each manufacturer will be advised of the results from the check test of his gear, and such minor discrepancies as were found will be called to his attention for appropriate action.

It is recommended that at the first opportunity the association provide for a series of capacity checks of approved draft gears taken from cars in service. The purpose of these tests would be to secure information as to how the capacity of the gear has stood up in service and its relation to the age of the gear, and to the capacity of new gears obtained in laboratory test. It would show if there is any value in the process of working-in used during manufacture, or if this merely establishes a fictitiously high capacity which disappears after the gear goes into service.

Recommended Changes in Draft-Gear Specifications

Based largely on observations made during the conduct of the two series of check tests of approved draft gears, it is recommended that the following changes be made in Specifications M-901-37 covering Approved Draft Gears for Freight Service:

1—Insert a new Par. 3 (e) as follows:

"The surfaces on which the gear closes are to be reasonably parallel, and shall be perpendicular to the axis of the gear."

The purpose of this provision is to avoid the introduction of any cocking action when the gear closes, which might throw the action of the forces out of line with the car sill.

2—Insert a new Par. 8 as follows, renumbering the present paragraphs accordingly: "Test for Capacity as Received—Before a gear in disassembled for internal measurement its capacity shall be determined in as few as possible drops of the 27,000 lb. tup in order to establish what capacity it has in the condition as shipped by the manufacturer. To be acceptable each gear must show not less than 15,000 ft. lb. capacity in this test." The purpose of this requirement is to insure that draft gears will be properly worked in during the process of manufacture, so that they will afford full car protection as soon as they are installed.

3—Add the following sentence to the end of Par. 3, Appendix A: "Specification for the working-in process, if any, used during the manufacture of the gear, including limits for acceptability of assembled gears, shall also be furnished." The purpose of this requirement is to place this information on record so that if any change in procedure is made the Association will be advised.

It is recommended that Par. 3 (a) of Spec. M-902-37, Purchase Specifications for Approved Draft Gears for Freight Service, be rewritten to agree with the corresponding paragraph in Specifications M-901-37. In the purchase specifications the outside measurements of the gear are designated as such that will permit it to be installed in a pocket the size of which is given, while in the regular specifications the actual measurements for the gear are given.

Tests of Waughmat Draft Gear for Freight Service

The Waugh Equipment Company has developed a rubber draft gear for freight service and has asked for approval for its installation. It is designed for installation in the standard draft gear pocket. Because its characteristics differ greatly from those of friction draft gears, it has been necessary to proceed differently in the matter of approval. Laboratory tests of an exploratory nature, including all of the regular specification tests, have been made under the Association's drop hammer, and car impact tests will be made under the supervision of the sub-committee. Approval has been given for the installation of a limited number of these gears in actual service, and their performance will be closely checked by the committee. The outcome of these investigations will determine the future course of action regarding this gear.

Tight-Lock Couplers Opening in Service

Our report for the year 1940 called attention to some trouble experienced with tight-lock couplers separating in service. It was the opinion of your committee that in view of the investigations made concerning these partings and the corrective measures applied, as well as tests made at that time, the trouble had been definitely corrected. However, during the past winter several additional separations involving tight lock couplers have been reported.

Careful investigations have been made of each of these partings and the manufacture and gaging of the couplers at the plant of the manufacturer. It has been definitely established that the partings were practically confined to tight-lock couplers cast prior to January 1, 1939. The known exceptions are a few partings involving tight-lock couplers manufactured since January 1, 1939, in which the anticreep arrangement had not been properly adjusted. A study of the individual couplers involved in these

separations has shown that these partings would not have occurred had the instructions been properly understood and the corrective measures outlined in the 1940 report been properly performed, especially as regards the adjustment to the secondary anticreep shoulder in the bar.

A joint meeting of your committee with the Mechanical Committee of the Coupler Manufacturers was held in Cleveland on February 27, 1941, at which time this subject of tight-lock coupler separations in service was thoroughly reviewed. At this meeting arrangements were made whereby the coupler manufacturers' representatives were to cooperate further with the railroads in checking tight-lock couplers cast prior to January 1, 1939, and to give instruction and assistance to make further corrective adjustments to the anticreep arrangement in the couplers where necessary.

The Mechanical Committee of the Coupler Manufacturers has prepared Circular No. 441 which shows in full-size arrangement the anticreep feature of the tight-lock coupler, the gages necessary to make these adjustments to the anticreep arrangement, including also detailed instructions covering the procedure to be followed in making these corrections. All this information has been made available, through the manufacturers, to the railroads having tight-lock couplers in service.

Maintenance Knuckle for Tight-lock Couplers

Tight-lock couplers manufactured prior to January 1, 1939, were produced without the benefit of machining important bearing surfaces and with more or less incomplete gaging practice. As a result of this early production practice such couplers are not uniform as regards interchange of parts, especially knuckles. These early knuckles may occasionally require replacement and when replaced with the latest standard knuckle the contour line may be a little too tight and cause difficulty in coupling with another tight-lock coupler.

The Mechanical Committee of the Coupler Manufacturers has given this subject careful attention and recommends that tight-lock knuckles furnished the railroads for maintenance should have the thickness of the knuckle reduced 1/16 in. by machining the metal from the pulling face. This change would provide approximately 1/16 in. clearance in a coupler having normal dimensions, but in many of these early couplers this proposed knuckle would provide a closer fitting contour than would be the case with the original knuckle that is being replaced. These knuckles will be furnished only for maintenance purposes and no change is being made in the standard knuckle furnished with new couplers. The catalog number of the standard tight-lock knuckle is T50 and for identification purposes the maintenance knuckle will bear the identification T50A.

Arrangements have been set up by the coupler manufacturers to have the standard tight-lock knuckles, now carried as spares by the railroads, returned to the manufacturers for machining of the face, which machining will be done free of charge.

On account of the necessity for prompt action your committee has authorized the coupler manufacturers to proceed accordingly, subject to your approval.

Contour Maintenance for A.A.R. Tight-Lock Couplers

To insure satisfactory inter-coupling between tight-lock couplers, where any repairs have been made to coupler body or parts, a simple contour gage has been provided. This gage will be furnished by the coupler manufacturers on orders.

Tight-Lock Coupler Specification

Last year, your committee presented specifications for tight-lock couplers and attachments with the recommendation that these specifications be referred to the Committee on Specificaions for Materials for approval and then submitted to letter ballot.

The Committee on Specifications for Materials did not approve the specifications as presented by the coupler committee on the grounds that couplers and coupler parts were steel castings and the material used in such parts should be incorporated in the specifications covering steel castings.

Your committee does not look at this proposition in the same light as the material specifications committee, since couplers and parts could not be considered as a general run of steel castings, but represent more particularly a highly specialized product in which only a limited number of manufacturers are engaged in their production.

In view of the important part couplers play in our transportation system and the highly specialized nature of their manufacture, it is the opinion of your committee that all of the requirements surrounding the production of couplers and parts should be incorporated in a single specification.

The tight-lock coupler specification was submitted to letter ballot vote last year and approved. The matter of form for inclusion in the A. A. R. Manual was further discussed with the Committee on Specifications for Materials without agreement being reached. In view of the importance of the specification, it has been placed in the Manual of Standard and Recommended Practice in separate form, pending further conference with the specifications committee.

Protection of Coupler Operating Mechanism

The investigation to develop a suitable means for the locking of coupler operating mechanism to prevent accidental opening of the coupler in service resulting from obstacles striking the operating lever is still in progress. It would be a simple procedure to lock the uncoupling rod and bail securely if the couplers were operated from one side only, at each end of the car. Also, an automatic locking side bracket could be used securely to lock both side operating rods individually. However, complications arise when an attempt is made to lock both the side operating rods and the bail, as a unit, at each end of the car when the operating arrangement is designed to operate from both sides of the car.

A questionnaire has been sent to the membership requesting an expression regarding a preference as to whether coupler operating mechanism on passenger cars should be operated from one side, only, or from both sides of the car. Replies to this questionnaire have not furnished as much information as was anticipated, since in a number of instances those answering were of the opinion that it referred primarily to the operation of tight lock couplers and therefore many roads not using tight lock couplers did not express an opinion.

A total of 63 roads replied to the questionnaire; 34 of these roads expressed a preference, 10 for both sides and 24 for one side; the remaining 29 failed to indicate which method of operation was preferred, as it was their interpretation the questionnaire was intended for tight-lock couplers only.

Separating of Type E Couplers Because of Inverted or Missing Toggles

A member road has called attention to the committee's reference in the 1940 report to Standard E couplers separating on account of inverted or missing rotary lock-lift toggles. The report advocated discontinuing the use of the dowel-type lock-lift lever and toggle, substituting therefor the riveted type. It was the understanding at the time that the coupler manufacturers would discontinue furnishing the dowel type. In investigating the statement made by the member road that the dowel type roary lock lifter and toggles were still being supplied, it developed that one coupler manufacturer, while not manufacturing any more of the dowel type lifters and toggles, was taking occasion to fill orders from stock already on hand. This subject was handled through the Coupler Manufacturers Mechanical Committee to the point that no further shipments will be made of the dowel type lifters and toggles.

Your committee has been advised that the Arbitration Committee will recommend a new paragraph to Sec. (c) of Interchange Rule 17, in which provision will be made for a repairing line to renew the old style bottom lock lifter or toggle, if defective, replacing them with either suitable parts in kind or with the two parts riveted together. In the latter case full charge may be made and scrap credit allowed for the old style parts removed. Your committee concurs in this recommendation of the Arbitration Committee.

Reclamation of Couplers

A study made by the Arbitration Committee in connection with coupler repairs developed that a large number of knuckles were being renewed for the purpose of bringing couplers within gage, whereas, the out-of-gage condition could have been corrected in a large percentage of such cases by renewing the knuckle lock only, thus reducing expenses to the car owner.

The Arbitration Committee has recommended for the consideration of the Coupler Committee a revision of Rule 18 (a-1). [See Arbitration Committee report.]

It is further recommended that the note accompanying Fig. D, Rule 18, Page 58 of the 1941 Code of Rules be changed from "Condemning limit for cracks horizontally inclined" to "Condemning limit for cracks extending in any direction."

Your committee accepts both recommendations as constructive changes which should be approved by the association and included in the Code of Rules.

Reclamation of Draft Keys—Limits for Wear

In connection with the practice of reclaiming draft keys as recommended in the 1940 report, request has come to your committee that further suggestions be made as to the wear limits within which the draft key reclamation might apply.

In the inquiry made regarding wear limits it developed that some roads have not encountered enough wear on the draft keys to give this subject serious consideration and little or no attention has been given either to wear limits or methods of reclamation. On other roads where the reclamation of draft keys has become a factor in car maintenance, it appears that the wear on the edge of the key is the governing factor in establishing the suitability of the key for reclamation. In other words, if the edge wear is within certain prescribed limits, the wear on the flat surface of the key will not be beyond the range of reclamation set up for edge wear. For this reason, it does not appear necessary to prescribe wear limits for key thickness.

The process of reclamation for draft keys as outlined in the 1940 report will take care of 3/8 in. wear in width at any cross section location. This limit may be applied to both 5-in. and 6-in. keys.

It is the suggestion of your committee that draft keys may be satisfactorily reclaimed if the maximum wear in width does not exceed 3/8 in. at any one point.

Elimination of Coupler-Yoke Filler Blocks

Your committee has been requested to support the recommendations of a local mechanical organization that provision be made for the elimination of filler blocks from the end of the coupler yokes, it being argued that frequently the blocks are missing, thus contributing to excessive slack in coupler attachments.

Your committee considers these filler blocks where used are serving a good purpose, as a protection against yoke or strap breakages and is further of the opinion if more attention was given to the maintenance of the blocks there would be fewer cases where they would be missing. For these reasons the committee does not approve the recommendation to discontinue the use of coupler yoke filler blocks.

Key Slots in Couplers

It has been the practice of some roads, in order to provide for vertical draft key attachments to the coupler shank, to burn a slot in the coupler shank between rivet holes. The ragged edges left by the burning of these slots form a ready origin for detail fractures. Applying localized heating to highly stressed parts, especially without annealing, is also conducive to development of fracture.

Your committee has been advised that the Arbitration Committee will include in its report a recommendation prohibiting this practice, and will make further provision that when couplers with burnt out key slots are removed for any reason, it will be at the expense of the owner.

The coupler committee concurs in this action taken by the Arbitration Committee.

Adding Filler Block in Head of Cast-Steel Yoke to Prevent Coupler Head from Drooping

Last year a member raised the question of adding filler block in the head of the cast-steel yoke to restrict the vertical movement of the coupler butt. Your committee has reviewed this matter and reports that the center line of the slot in the coupler butt is 1/4 in. above the slot in the yoke. Key slot in the center sill is on the center line of draft. With the tolerances provided, when the coupler and draft attachments are in place on the car they are all on the horizontal center line, with the vertical weight reaction on the key through the center sills.

In 1923 one of the coupler manufacturers cast yokes with this filler block for application to 1,000 cars. Investigation is going on to develop what, if any, beneficial results were obtained therefrom.

Your committee wishes to express its appreciation to the coupler manufacturers for the cooperative assistance rendered by the Mechanical Committee of the Coupler Manufactruers in the joint work carried on during the past year.

The report was signed by R. L. Kleine (chairman), assistant chief motive power-car, Pennsylvania; H. W. Coddington (vice-chairman), research and test engineer, N. & W.; E. E. Root, chief motive power, D. L. & W.; L. P. Michael, chief mechanical engineer, C. & N. W.; W. Bohnstengel, engineer of tests, A. T. & S. F., and H. W. Faus, engineer motive power, N. Y. C.

Exhibit A—Instructions Covering Adjustments to Improve the Anticreep Arrangement in Tight-Lock Couplers

The A. A. R. tight-lock couplers cast prior to January 1, 1939, were not correctly modified to improve the anticreep arrangement as approved by the Committee on Couplers and Draft Gears during March 1940.

The secondary anticreep in tight-lock couplers cast prior to January 1, 1939, consisted of a projection on the upper-guard-arm side of the lock that engaged a recess in the guard-arm wall of the bar. In service this recess would become filled with dirt, which interfered with proper functioning of the secondary anticreep. The length of the bottom lock hole from front to back was not important during this period, therefore careful attention was not given to control of this dimension.

The secondary anticreep in tight-lock couplers cast after January 1, 1939, consisted of a shoulder on the back of the toggle that engaged a ledge formed on the bottom rear wall of the lock hole. This change in the location of the secondary anticreep made it necessary to provide gages closely to control the length of the bottom lock hole.

When the changes to improve the anticreep arrangement, as approved during March, 1940, were made in tight-lock couplers cast prior to January 1, 1939, proper attention was not given to adjusting the length of these bottom lock holes. Investigations have shown that recent partings involving tight-lock couplers are largely the result of the bottom lock hole being too long, which permits an ineffective anticreep arrangement. Only couplers cast prior to January 1, 1939, have been involved in these recent partings.

The following sketches show correct and incorrect anticreep arrangement in tight-lock couplers. They illustrate how correct adjustments may be made and gages necessary to make correct adjustments.

Fig. 1 shows the tight-lock coupler anticreep arrangement with all parts in normal closed position and Fig. 2 shows the tight-lock coupler anticreep arrangement engaged to prevent upward movement of the lock. This illustrates the correct functioning of the anticreep arrangement when all parts are normal.

Fig. 3 shows the anticreep arrangement as it functions in a bar where the adjustments were made incorrectly. Note that

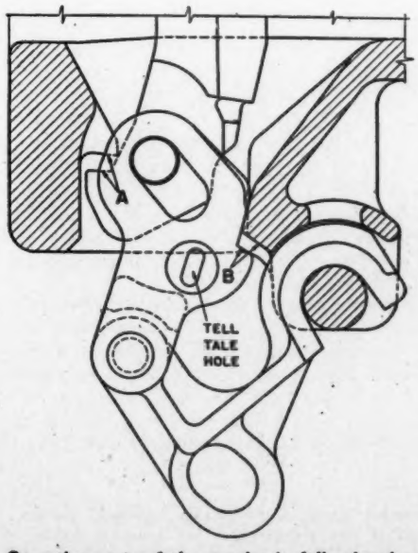


Fig. 1—Operating parts of the coupler in fully closed position

primary anticreep *A* is disengaged and secondary anticreep *B* is only partially engaged. If force is applied to lift the lock, the toggle tends to rotate about the secondary anticreep, thus rounding the corners of the toggle and bar. This action may also bend or spread the rotor lever.

Fig. 4 shows Gage No. 29875 correctly positioned on the bar, thus indicating that the adjustments to improve the anticreep arrangement were not made correctly in the bar. Note space between gage and bar at *C* and *D*.

Fig. 5 shows the same conditions as in Fig. 4 except with the anticreep adjustments made correctly to meet the requirements of gage No. 29875.

Method of Procedure

1—All tight-lock couplers having cast date prior to January 1, 1939, or serial number less than 1100, should be checked for effective anticreep arrangement. Use gage No. 29875 as shown in Fig. 4. It will be necessary to remove the knuckle and lock to make this check properly. The lock and toggle should also be checked for correctness using gage No. 1161 as described for Figure 8. (Figs. 6 to 8, incl., are not included in the present abstract of the committee's report are printed in the original report as submitted before the association.)

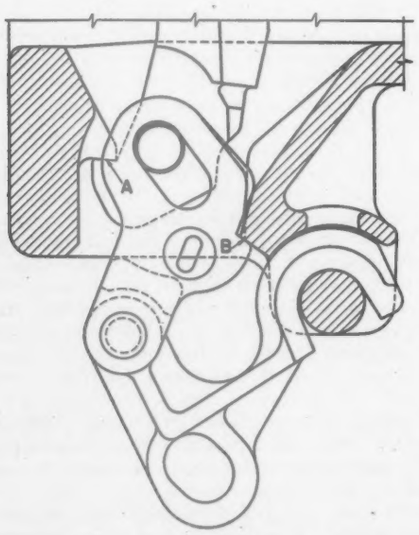


Fig. 2—Operating parts of the coupler with the primary and secondary anti-creep engaged

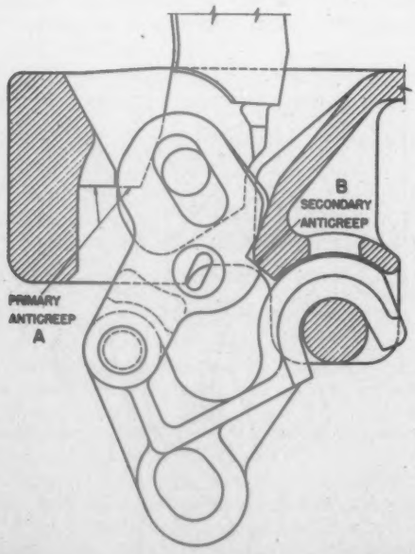


Fig. 3—Operating parts in anti-creep engaged position. Note the disengagement of the primary and the reduced overlap of secondary anti-creep due to incorrect modifications as in Fig. 4

2—Any couplers that do not check correctly (Item 1) should receive attention to improve the anticreep arrangement. It is recommended that couplers requiring further adjustment be removed from the car in order that the work may be properly performed and without haste or disturbance. This may be accomplished by having corrected couplers available to replace couplers removed so that the car may be returned to service.

3—Those couplers requiring further attention should have the secondary anticreep ledge rebuilt by electric welding, using gage No. 1160. The drawbar primary anticreep *A* should also be

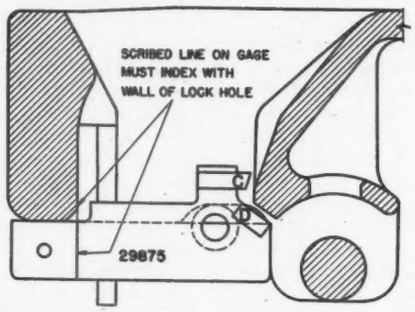


Fig. 4—Gage No. 29875 properly applied to incorrectly modified coupler as in Fig. 3—Clearance at C and D must be built up by welding as in Fig. 5

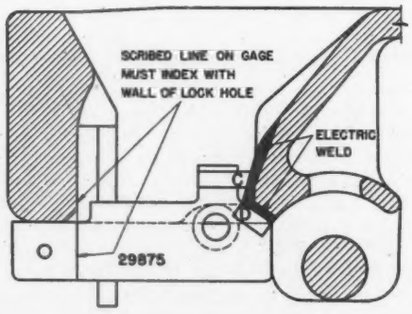


Fig. 5—Rear wall of the lock hole and secondary anti-creep shoulder corrected by electric welding to meet requirements of gage No. 29875

checked with gage No. 1160, Fig. 7, and any necessary adjustments made. Gage No. 29875 should be used to make a final check of these corrections as shown in Fig. 5. Any adjustments to the toggle or lock, as indicated by gage No. 1161, Fig. 8, should be made or the part replaced.

4—The coupler and parts should be reassembled and a final check made to determine the effectiveness of the anticreep arrangement. This may be done by inserting a chisel, or similar instrument, between the lock and knuckle-tail shelf and prying the lock upward while forcing the lock leg rearwardly. This check should show not less than 3/16 in. overlap at the primary anticreep *A* and 1/4 in. overlap at the secondary anticreep *B*, Fig. 2. If this final check is not satisfactory, all conditions should be rechecked and any necessary adjustments made.

5—The Brinell hardness number of the built-up surface should be approximately 160. Fleetweld No. 5, made by Lincoln Electric Company, Cleveland, Ohio, and Shurweld N, made by Hollup Corporation, Chicago, are satisfactory welding rods for this work.

6—When corrected couplers are reapplied to cars, they should be carefully checked for operation and any necessary adjustments should be made to insure free operation of the coupler. The A. A. R. approved type No. 3 tight-lock coupler operating arrangement is recommended.

Discussion

There was no discussion of that part of the report devoted to draft gears. At the invitation of the presiding officer, H. W.

Gilbert, chairman of the Coupler Manufacturers' Mechanical Committee, said that for many years since the adoption of the Type E coupler the committee has had close and pleasant relations with the Mechanical Division committee and attempted to do whatever was necessary to improve coupler performance. He referred to Mr. Cantley's study of coupler failures at low temperatures and said that this should develop some definitely helpful and useful information.

Mr. Gilbert said that the committee's report contains a clear description of the problem which has arisen in connection with tight-lock couplers and that the first attempt at corrections did not prove to be entirely satisfactory on account of the lack of proper adjustments. Mr. Gilbert stated that improvements in design, including machining, has enabled tight-lock couplers manufactured since 1939 to give satisfactory service, but further development and improvements are still being sought to be passed on to the Mechanical Division committee.

In response to a question, Chairman Kleine said that when difficulty is encountered due to the knuckle dropping on the bottom wall of the coupler, it is necessary only to apply a washer and raise the knuckle.

J. McMullen, superintendent car department, Erie, referred to the changes in Rule 18 and said that only a small percentage of couplers can be reclaimed by this method, the application of a properly conditioned knuckle being cheaper in the long run. He said that, at the suggestion of a member line which advised changing the lock rather than the knuckle, this method was tried on the Erie and they were not able to bring the pulling face of the knuckle within the gage limits.

E. B. Hall, chief mechanical officer, C. & N. W., said that there is need for a more positive lock, to avoid any possibility of couplers parting. Chairman Kleine replied that the committee feels keenly whenever there is an instance of coupler parting and that, without proper gages and gaging practice, this trouble is bound to occur occasionally. He said that the working surfaces of certain coupler parts must be machined to assure uniform results. With the present improved coupler and a more general knowledge of how to use the gages, he believes that the coupler problem is largely solved, although further improvements are still being studied.

K. F. Nystrom, mechanical assistant to executive vice-president, C. M. St. P. & P., said that the Milwaukee has no tight-lock couplers in service. He hoped that the committee would specify uncoupling from one side, which makes it more practicable to apply a locking device to the uncoupling lever handle. Mr. Nystrom said that he has accumulated from dismantled cars over 1,000 Type D couplers with 5-in. by 7-in. shanks, which he will use by the application of wrought- or cast-steel yokes in the interest of conservation of material.

The report was accepted and recommendations submitted to letter ballot.

Report on Locomotive Construction

Design of Fundamental Parts of Locomotives

Piston Ring Grooves for Lip Type Sectional Packing

The sub-committee was requested to prepare a proposed design of piston grooves that would take all types of lip type sectional packing rings now being manufactured; also, to look into the matter of standardizing grooves for snap type piston rings. It was decided that no consideration of standardizing grooves for snap type piston rings would be made as most railroads are changing to sectional rings on new piston applications.

Two designs of grooves for lip-type sectional rings were included in the report—one for the two-ring type, and one for a three-ring type. Grooves 1-in. wide by 1-in. deep were decided on for a standard and, while this size groove does not accommodate some of the rings now being manufactured, the sub-committee felt that manufacturers can change their rings to fit this size groove, and railroads can then use any make of lip type sectional packing without having to change pistons.

It was recommended that this be submitted to letter ballot for inclusion in the Manual as recommended practice.

Cylinder and Valve Head Studs

The sub-committee was requested to prepare a proposed design of studs to be used for holding cylinder heads and valve chamber heads.

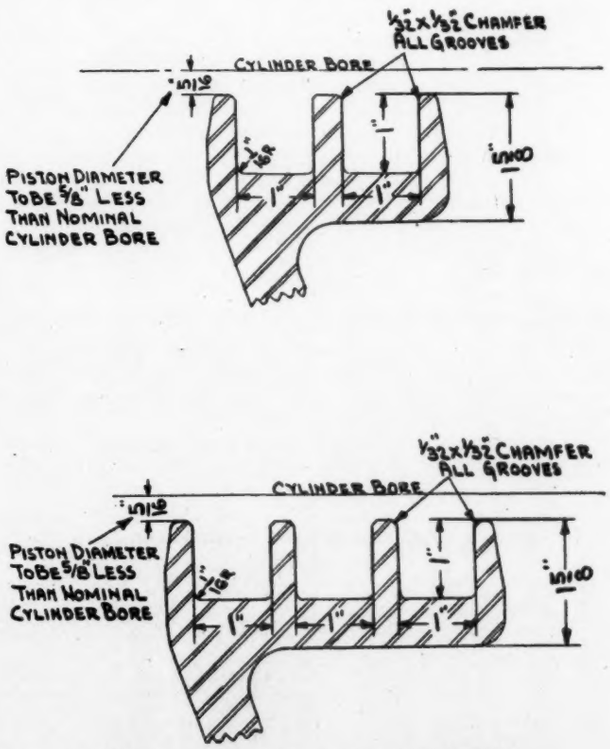
Designs included in the report are for new work, and for repairs to present cylinders where holes have become worn and an over-size stud is required in the cylinder end.

It was recommmended that this be submitted to letter ballot for inclusion in the Manual as recommended practice.

Screwed Pipe Fittings for 300 lb. Pressure Seamless Steel Couplings

The present standard coupling shown on Page L-139 of the Manual may be made of malleable iron or steel to A. A. R. Material Specification M-404, which prescribes a breaking test only, no chemical or physical requirements being shown. The design shown on Page L-139 is apparently based on the use of malleable iron, as the wall thicknesses are in general heavier than necessary for steel couplings.

In view of the extensive use of steel couplings the committee has prepared and now submits for approval as recommended practice, a design (a drawing of which was included in the report) which conforms to the standards of the American Petroleum Institute and which will weigh less and should cost less than steel couplings made to present A. A. R. standard dimensions.



Piston-ring grooves for lip type sectional packing

The material for these couplings is shown as seamless steel, to A. A. R. pipe specification M-111.

The adoption of this design will require a change in the title of the couplings shown on Page L-139 to read "Malleable Iron Coupling."

Fittings for Welding Iron or Steel Pipe on Locomotives

A table was included in the report of 32 replies to a questionnaire sent to a selected list of member roads and the locomotive builders, with respect to the welding of piping on locomotives

and the use of special welding fittings. Twenty-one of the 32 replies received reported that piping was welded as indicated in the table, but only four reported the use of any special welding fittings.

In view of the limited use as apparent from the replies received, and inasmuch as welding fittings can be readily obtained in the open market if desired, the sub-committee was of the opinion that it is not necessary to set up any standard for special welding fittings and so recommended.

Exhaust Steam Injectors and Exhaust Steam Feed Water Heaters

The sub-committee has continued its studies on the economies of various types of exhaust steam injectors and exhaust steam feedwater heaters for the purpose of determining more accurately the operating costs of these appurtenances.

In the previous analysis, the maintenance cost figures were in some cases reported inadequately and in others not given at all because the participating railroads did not detail their accounting records sufficiently to determine actual costs of specific parts repaired or renewed. To develop more accurate maintenance and repair costs, railroads having exhaust steam feedwater heaters and exhaust steam injectors in service, were asked to keep a record of all material and labor charges, for both classified and running repairs, for a period of six months, namely July 1 to December 31, 1940.

Such reports were received from 30 railroads for exhaust steam injectors and 53 railroads for exhaust steam feedwater heaters of all types.

The statements included in the report show the results of tabulated reports for labor and material costs on a dollar per mile basis for classified and for running repairs, and also a combined cost of labor and material and of classified and running repairs, i.e., a total operating cost for each type of equipment as reported. They are further separated to indicate maintenance and repair costs for the various types of injectors and heaters irrespective of age as compared with similar equipment as applied in the last five years, (1936 to 1940 inclusive). This differentiation was deemed advisable to show the difference in cost for maintaining injectors and heaters regardless of age and for maintaining injectors and heaters which are comparatively new or considered modern.

Development and Use of Oil-Electric Locomotives

This sub-committee has continued to assemble information as to the extended use of this type of equipment, and has brought up to date all information previously assembled by adding thereto units placed in service during the year 1940.

As of December 31, 1940, 1,111 units had been placed in operation since 1925, 362 of which, or 33.5 per cent, were placed in service during the year 1940. There were 157 units on order as of January 1, 1941, which exceeds considerably the number of units on order at the beginning of any previous year.

Table I—Trend of Diesel-Electric Locomotive Installations

Horsepower	Delivered 1940	Delivered prior to 1940	Per cent increase during 1940
Less than 300	1	25	4.0
300 to 600	60	131	45.8
600 to 900	155	367	42.3
900	...	80	...
950 to 2,000	97	102	95.0
2,000 to 6,000	49	44	111.0
Total	362	749	51.7

Prior to the year 1940 there were 44 units between 2,000 hp. to 6,000 hp. in service. During the year 1940, 49 additional such units were placed in service.

Table I indicates the rate of increase of Diesel-electric installations of varying horsepowers for the year 1940 as compared with units of the same horsepower placed in service prior to January 1, 1940:

Table II shows that the number of Diesel units in freight service increased from 4 in 1939 to 20 as of December 31, 1940, and the total units in road passenger service increased from 69 to 118. In other words during the year 1940 the rate of increase of switchers kept pace with previous years, but the installation of Diesel-electric locomotives in road service exceeded any previous year.

In an attempt to determine the availability, lubricating and fuel oil performance, and cost of repairs as divided between electrical equipment and Diesel equipment, 138 railroads were requested to furnish information. Fifty-nine railroads advised that they did not operate Diesel locomotives, 30 railroads furnished information in time and in such form that it could be included in this report, and the remainder of the railroads did not report or the information was not furnished in the form requested.

Table II—Assignment of Diesel Locomotives in Service by Class of Service—As of December 31, 1940

Horsepower	CLASS OF SERVICE Switch and Transfer	Road Freight	Road Passenger	Grand Total
Less than 300	26	..	..	26
300	120	..	..	120
310	1	..	..	1
320	1	..	..	1
340	6	..	..	6
350	7	..	..	7
360	13	..	..	13
380	16	..	..	16
400	8	..	1	9
460	3	..	..	3
500	5	[a]2	..	7
530	[a]7	..	..	7
550	1	..	..	1
600	426	1	4	431
640	1	..	..	1
650	1	..	..	1
660	73	7	..	80
720	1	..	..	1
750	..	1	..	1
800	6	..	1	7
900	[b]80	..	..	80
950	..	..	1	1
1000	[b]160	9	3	172
1100	2	..	..	2
1200	..	..	7	7
1330	..	..	[c]2	2
1500	2	..	..	2
1600	1	..	..	1
1800	2	..	10	12
2000	4	..	49	53
2100	..	..	1	1
2400	..	..	4	4
3000	..	..	2	2
3600	..	..	10	10
4000	..	..	16	16
5400	..	..	2	2
6000	..	..	5	5
Total	973	20	118	1,111

[a] One unit in combination switch and road freight service.
[b] Two units indicated as road-switchers.
[c] Used singly in passenger and in combination in freight service.
[d] Reported as freight and switch locomotives.

Tables III and IV show the details of operation for a six months period from July 1 to December 31, 1940 for switching and road locomotives, respectively. The report is assembled on the basis of unit costs per hour in the case of locomotives in switch and transfer service, and unit costs per mile for locomotives in road service. The information included covers only locomotives which had been placed in service prior to January 1, 1940, since low maintenance costs and high availability is expected from locomotives less than one year old. To have included such locomotives in the statement would not have reflected as accurately what might be expected in the way of average performance.

The committee emphasized that the lubrication, fuel, and maintenance costs shown in the table cover only a six months' test period and while considerable variation in the unit repair costs to locomotives of the same horepower and of approximately the same age may appear, this is due to the fact that in some cases the hours or miles operated during the test period were reduced on some locomotives on account of being held out of service for repairs, and at the same time there was an increase in the repair costs due to these repairs. This resulted in a high average cost for the test period, which, of course, will be reduced as additional miles are accumulated.

Standardization of Valves—Globe and Angle Valves for Steam Locomotives for 300 lb. Pressure

During the past year the committee has been studying the

Table III—Operating Cost of Diesel-Electric Switching Locomotives—Six-Month Period Ending December 31, 1940

Road Index	Placed in Service	Hours Prior to 7- 1-40	Hours Assigned Average per Month	Hours Operated Average per Month	Per Cent of Assignment Operated	GALLONS LUBRICATING OIL Total	GALLONS LUBRICATING OIL per Hour	GALLONS FUEL OIL Total	GALLONS FUEL OIL per Hour	COST OF REPAIRS Electrical Equipment Labor	Electrical Equipment Material	Diesel Equipment Labor	Diesel Equipment Material	TOTAL (Diesel Electric Mechanical)	Repair Cost per Hour
300 HP															
25	4-18-27	67 186	735	706	96.00	265	.062	18 362	4.330	$ *-----	$ *-----	$ *-----	$ *-----	$ 740.00	$ .1746
26	10-19-26	70 687	558	531	95.00	85	.026	11 795	3.700	*-----	*-----	*-----	*-----	664.00	.2085
26	5- 2-26	64 434	454	317	70.00	88	.054	6 794	3.570	*-----	*-----	*-----	*-----	3 133.00	1.6472
39	-26	28 244	189	179	94.00	107	.100	1 395	1.300	*-----	*-----	*-----	*-----	220.99	.2061
67	1- 7-32	60 766	736	661	89.90	234	.074	14 296	3.600	*-----	*-----	*-----	*-----	619.76	.1561
67	7-23-31	64 951	736	450	61.90	360	.133	9 609	3.560	*-----	*-----	*-----	*-----	3 164.98	1.1722
67	8-29-31	53 379	736	487	66.10	130	.044	9 163	3.140	*-----	*-----	*-----	*-----	1 310.43	.4485
67	1- 2-26	39 759	736	406	55.10	305	.125	9 770	4.010	*-----	*-----	*-----	*-----	1 592.16	.6536
67	1-22-32	47 979	736	418	56.80	400	.159	9 807	3.910	*-----	*-----	*-----	*-----	1 898.93	.7568
138	*-----	*-----	736	516	70.00	342	.110	5 300	1.710	*-----	*-----	*-----	*-----	608.00	.1966
TOTAL		497 385	6 352	4 671		2 376		96 291		$ -----	$ -----	$ -----	$ -----	$ 13 952.25	
Average		55 265	635	467	73.55	238	.0849	9 629	3.4352	-----	-----	-----	-----	1 395.23	$ .1978
600 HP															
6	2- -35	35 654	736	512	70.00	569	.185	20 222	6.600	$ *-----	$ *-----	$ *-----	$ *-----	$ 1 738.16	$ .5658
6	6- -37	31 554	736	563	76.00	556	.164	26 095	7.700	*-----	*-----	*-----	*-----	2 247.28	.6653
6	8- -37	22 257	736	566	77.00	463	.136	24 547	7.200	*-----	*-----	*-----	*-----	1 662.41	.4896
6	6- -36	29 014	736	551	75.00	531	.160	19 797	6.000	*-----	*-----	*-----	*-----	2 922.77	.8835
6	7- -37	23 145	736	495	67.00	525	.179	11 359	3.800	*-----	*-----	*-----	*-----	1 585.62	.5142
6	7- -37	23 087	736	713	97.00	555	.129	23 092	5.400	*-----	*-----	*-----	*-----	371.98	.0870
6	7- -37	19 727	736	686	93.00	530	.128	15 688	3.800	*-----	*-----	*-----	*-----	1 695.64	.3631
15	12- 8-36	23 605	699	699	100.00	379	.096	21 218	5.360	*-----	*-----	*-----	*-----	198.00	.0500
17	10- -35	33 104	602	602	100.00	393	.108	18 444	5.106	199.08	22.85	517.36	70.82	810.00	.2242
17	5- -35	36 321	602	602	100.00	391	.108	22 599	6.264	258.87	25.40	496.69	56.43	837.19	.2320
17	6- -34	37 613	593	593	100.00	507	.144	35 258	9.906	353.44	65.17	663.43	175.74	1 257.78	.3535
17	6- -34	44 850	591	591	100.00	395	.108	20 504	5.770	240.59	29.62	775.22	703.30	1 748.73	.4927
24	10- 2-37	22 269	679	677	99.60	518	.127	22 882	5.640	80.23	14.56	362.08	391.89	1 024.23	.2523
24	10- 2-37	22 513	697	676	99	562	.139	22 650	5.580	91.31	37.15	348.31	661.31	1 308.83	.3227
24	10- 2-37	22 343	697	676	96.70	721	.178	22 506	5.550	94.49	9.55	348.33	648.70	1 401.06	.3453
24	6-22-39	8 515	720	717	99.60	443	.103	17 099	3.970	72.61	206.84	263.91	320.99	864.35	.2008
24	6-22-39	8 586	727	694	96.00	481	.116	21 640	5.200	65.42	57.58	613.70	397.44	1 135.80	.2730
24	6-22-39	8 197	720	714	99.10	481	.112	21 489	5.010	70.98	64.10	473.58	200.81	809.40	.1888
26	8-20-30	62 378	657	475	72.00	374	.131	19 784	6.940	*-----	*-----	*-----	*-----	2 659.00	.9320
26	1-14-39	10 795	664	621	94.00	518	.138	18 783	5.040	*-----	*-----	*-----	*-----	1 257.00	.3373
28	1- -38	19 869	736	577	96.70	443	.119	15 226	4.400	*-----	*-----	*-----	*-----	2 555.00	.7382
28	1- -38	20 302	736	696	94.00	462	.111	18 233	4.360	*-----	*-----	*-----	*-----	794.00	.1901
28	1- -38	19 527	736	594	71.00	430	.121	23 319	6.540	*-----	*-----	*-----	*-----	1 211.00	.3397
32	8- 8-39	6 934	736	613	83.00	390	.106	21 032	5.720	137.78	67.03	809.44	274.86	1 289.11	.3505
34	9- 6-32	54 033	734	584	79.00	509	.145	21 400	6.100	235.28	145.72	690.93	537.84	1 609.77	.4593
34	5- 5-38	16 912	734	702	95.70	533	.126	13 821	3.280	186.89	212.93	575.98	264.35	1 240.15	.2943
34	5- 9-38	16 216	731	651	89.00	354	.091	13 717	3.510	189.01	20.45	485.91	272.88	968.25	.2481
34	5-22-39	6 662	587	570	97.00	430	.126	12 902	3.770	183.13	66.30	279.22	477.24	1 105.89	.3232
36	8- 8-36	32 159	736	700	95.00	538	.130	19 705	4.700	*-----	*-----	*-----	*-----	1 714.00	.4083
36	8- 5-36	31 116	690	684	99.20	455	.110	21 560	5.200	*-----	*-----	*-----	*-----	1 833.00	.4464
36	8- 4-36	31 032	698	692	99.00	426	.100	21 611	5.200	*-----	*-----	*-----	*-----	1 495.00	.3602
48	9-28-37	21 527	528	515	97.63	314	.101	20 528	6.630	193.80	30.35	239.85	28.23	816.25	.2640
48	1-20-37	26 157	693	683	98.53	497	.121	14 989	3.650	141.79	39.51	331.01	398.69	1 079.05	.2631
48	1- 4-37	27 656	711	679	95.61	658	.161	20 841	5.110	357.65	108.02	267.47	361.47	2 174.41	.5333
48	12-31-36	26 466	684	599	87.51	560	.156	18 540	4.850	371.56	46.08	864.89	959.46	2 522.62	.7017
48	12-30-36	27,777	619	608	98.25	419	.113	17,780	4.870	$ 164.57	$ 9.53	$ 295.16	$ 148.58	$ 914.13	$ .2505
48	12-28-36	26,826	712	654	91.92	583	.168	15,807	4.020	228.06	180.37	314.10	251.89	1,306.61	.3327
48	12-28-36	25,678	697	685	98.33	702	.171	19,858	4.820	178.50	20.66	334.74	160.14	946.33	.2301
49	12-26-39	24,906	736	688	93.43	594	.144	26,121	6.330	91.63	67.95	232.72	251.76	820.44	.1988
54	2-11-39	11,531	736	696	94.60	535	.128	22,170	5.310	*-----	*-----	*-----	*-----	2,245.12	.5374
54	2- 8-39	11,436	736	642	87.20	268	.070	16,463	4.270	*-----	*-----	*-----	*-----	1,555.34	.4037
63	1-31-40	2,871	614	582	94.80	328	.094	23,357	6.680	179.00	64.00	318.00	368.00	2,672.00	.7647
63	12-29-39	6,183	726	666	91.80	395	.096	22,269	5.560	177.00	588.00	415.00	407.00	1,992.00	.4981
63	12-29-39	4,230	731	696	95.30	420	.102	22,017	5.270	128.00	242.00	274.00	214.00	968.00	.2318
63	12-30-39	399	604	553	91.50	396	.120	21,233	6.390	183.00	62.00	425.00	462.00	1,362.00	.4102
67	12-22-38	12,156	736	671	91.10	263	.065	14,174	3.520	*-----	*-----	*-----	*-----	1,134.60	.2819
67	11-14-38	13,561	736	690	93.80	340	.072	16,498	3.980	*-----	*-----	*-----	*-----	1,062.97	.2560
67	11-14-38	13,167	736	669	91.00	287	.071	15,889	3.950	*-----	*-----	*-----	*-----	578.54	.1440
67	8- 8-38	13,631	736	543	73.70	425	.130	18,987	5.830	*-----	*-----	*-----	*-----	3,670.22	1.1269
67	9- 1-37	21,532	736	692	94.00	505	.121	19,998	4.820	*-----	*-----	*-----	*-----	521.55	.1256
67	1- 9-33	49,046	736	546	74.10	400	.122	21,309	6.510	*-----	*-----	*-----	*-----	1,246.99	.3808
71	7-12-37	21,311	584	577	98.80	293	.084	12,899	3.720	102.00	58.00	301.00	387.00	1,080.00	.3118
71	7-13-37	21,631	584	562	96.20	372	.108	16,033	4.750	114.00	39.00	467.00	289.00	1,078.00	.3200
71	7-13-37	22,089	616	601	97.50	258	.072	16,449	4.560	106.00	898.00	370.00	557.00	1,676.00	.4650
71	7-13-37	20,146	530	530	100.00	300	.096	16,026	5.050	47.00	42.00	63.00	689.00	946.00	.2982
71	9-11-39	6,031	574	556	97.00	195	.090	12,118	5.440	98.00	7.00	295.00	131.00	641.00	.1920
71	9-11-39	5,571	664	630	94.70	267	.072	17,360	4.600	159.00	28.00	587.00	219.00	1,175.00	.3114
74	9-30-39	6,085	736	658	89.30	346	.087	20,600	5.200	*-----	*-----	*-----	*-----	1,902.27	.4823
75	9- -38	14,209	736	615	83.50	1,047	.280	23,666	6.420	*-----	*-----	*-----	*-----	2,999.00	.8130
75	3- -38	16,410	510	510	100.00	549	.150	14,505	4.730	*-----	*-----	269.00	2,730.00	6,059.00	1.9781
85	4-15-38	15,246	646	641	99.10	329	.090	22,606	5.090	137.95	18.44	3,977.00	2,082.00	694.99	.1808
85	3-12-38	16,717	653	649	99.40	325	.080	22,308	5.700	136.40	29.93	283.71	34.12	578.17	.1485
85	3-13-38	15,928	669	667	99.80	285	.070	24,224	6.000	172.43	21.84	246.47	14.16	703.55	.1757
85	3- 7-38	16,257	669	664	99.30	151	.040	23,223	5.800	119.58	29.34	240.76	26.59	560.51	.1408
85	10-30-36	23,306	660	653	98.90	964	.250	19,375	4.900	306.90	70.97	249.25	33.51	1,289.08	.3291
85	4-19-38	15,592	609	604	99.00	60	.020	22,589	6.200	228.45	31.76	519.38	107.43	744.22	.2055
85	10-23-36	19,861	676	638	94.30	548	.140	20,981	5.500	176.80	100.83	297.80	22.13	1,344.61	.3513
99	7-17-39	7,747	736	654	88.80	433	.110	17,514	4.470	183.14	64.55	648.23	67.94	1,007.16	.2568
100	4-20-36	32,244	657	564	85.60	318	.094	25,892	7.660	270.71	85.51	487.65	247.42	4,477.33	1.3247
113	1-13-40	3,641	736	631	85.85	117	.031	23,798	6.270	405.22	65.53	111.41	1,175.87	1,028.16	.2712
113	1-13-40	3,862	736	659	89.56	218	.055	27,808	7.030	231.31	50.06	143.00	66.62	949.01	.2400
113	9- 1-39	6,102	736	670	91.53	234	.058	24,687	6.100	148.88	19.52	225.14	174.11	491.23	.1221
113	12-13-39	4,114	736	634	86.23	277	.073	13,816	3.620	238.61	2.46	130.17	12.31	941.40	.2472
113	12-18-39	3,809	736	608	82.61	465	.127	13,389	3.670	155.76	61.18	352.85	97.81	1,203.48	.3299
113	11-29-39	3,922	736	617	83.88	312	.084	15,645	4.220	198.02	65.55	478.22	307.11	1,733.61	.4680
113	11-28-39	4,054	736	595	80.89	279	.078	15,980	4.470	192.34	53.51	334.95	796.28	737.73	.2065
113	12- 1-39	4,233	736	589	80.14	230	.065	13,902	3.920	291.02	152.00	409.08	[a]184.67	785.50	.2220
123	3- 6-39	8,764	736	615	83.61	309	.084	15,439	4.180	116.19	95.11	518.30	[a]195.25	312.97	.0848
138	1-28-39	11,555	736	700	95.00	380	.090	18,943	4.500	*-----	*-----	259.85	[a]635.29	809.51	.1928
138	*-----	*-----	736	673	91.40	225	.056	30,997	7.670	*-----	*-----	*-----	*-----	1,108.20	.2746
138	*-----	*-----	736	618	83.94	292	.078	24,757	6.680	*-----	*-----	*-----	*-----	2,172.45	.5860
138	*-----	*-----	736	690	93.70	449	.108	22,654	5.480	*-----	*-----	*-----	*-----	1,374.95	.3322
TOTAL		1,497,462	57,372	52,160		35,039		1,651,901		$9,189.39	$3,993.81	$24,281.05	$18,332.28	$117,330.96	
Average		18,955	691	628	90.93	422	.1119	19,902	5.2776	180.18	78.31	476.10	359.46	1,413.63	$ .3749

NOTES.- *Information not available.

[a]Credit.

Table III—Operating Cost of Diesel-Electric Switching Locomotives—Six-Month Period Ending December 31, 1940—Continued

Road Index	Placed in Service	Hours Prior to 7- 1-40	Hours Assigned Average per Month	Hours Operated Average per Month	Per Cent of Assignment Operated	GALLONS LUBRICATING OIL Total	GALLONS LUBRICATING OIL per Hour	GALLONS FUEL OIL Total	GALLONS FUEL OIL per Hour	COST OF REPAIRS Electrical Equipment Labor	Electrical Equipment Material	Diesel Equipment Labor	Diesel Equipment Material	TOTAL (Diesel Electric Mechanical)	Repair Cost per Hour
660 HP															
65	9-26-39	6 271	701	631	90.00	135	.1145	19 650	5.176	$ 95.70	$ 21.20	$ 265.32	$ 216.62	$ 820.28	$ .2167
66	9-28-39	5 496	684	612	89.00	254	.0691	14 007	3.812	129.79	105.32	259.26	78.17	781.82	.2127
75	9- -39	5 291	566	566	100.00	450	.1300	27 324	8.050	*-----	*-----	*-----	*-----	1 420.00	.4181
85	11-13-36	24 542	677	663	97.90	466	.1200	20 520	5.200	299.48	91.34	446.58	176.15	1 272.55	.3200
126	12- 6-39	4 907	736	696	94.60	503	.1205	25 278	6.053	199.08	122.96	629.62	196.69	1 149.89	.2752
TOTAL		46 507	3 364	3 168		2 108		106 779		$ 724.05	$ 340.82	$ 1 600.78	$ 667.63	$ 5 443.94	
Average		9 301	673	634	94.18	422	.1110	21 356	5.6170	181.01	85.21	400.20	166.91	1 088.79	$ .2864
900 HP															
6	9- -37	22 323	736	624	85.00	743	.198	18 189	4.900	$ *-----	$ *-----	$ *-----	$ *-----	$ 2 304.18	$ .6156
6	9- -37	20 872	736	611	83.00	870	.255	21 683	5.900	*-----	*-----	*-----	*-----	2 253.69	.6143
6	9- -37	21 785	736	647	88.00	514	.132	18 635	4.800	*-----	*-----	*-----	*-----	1 020.14	.2629
24	11-28-37	19 468	697	619	88.80	1 523	.410	30 394	8.180	150.91	19.51	383.11	1 562.15	3 583.58	.9649
24	12- 5-37	19 574	684	664	97.10	915	.289	33 302	8.350	95.60	35.05	461.86	389.73	1 405.58	.3525
26	1-14-39	11 085	706	660	93.00	160	.242	24 047	6.070	*-----	*-----	*-----	*-----	964.00	.2436
48	11- 6-37	20 884	703	631	89.71	620	.163	22 085	5.540	588.14	113.28	774.44	1 316.44	4 144.50	1.0953
48	11- 6-37	21 465	660	646	97.78	786	.203	25 968	6.700	332.03	30.25	394.67	711.25	1 709.58	.4414
48	11-26-37	20 517	544	470	86.37	404	.143	20 711	6.340	456.81	76.67	665.04	664.88	3 373.90	1.1960
54	1-10-38	15 136	736	693	94.15	1 246	.300	29 512	7.100	*-----	*-----	*-----	*-----	2 266.47	.5451
54	1-10-38	19 593	736	636	86.40	1 510	.396	29 798	7.810	*-----	*-----	*-----	*-----	4 163.32	1.0907
67	12-20-37	21 250	736	638	86.60	647	.169	23 179	6.060	*-----	*-----	*-----	*-----	2 790.57	.7292
67	12-20-37	21 195	736	689	93.50	855	.206	30 734	7.438	*-----	*-----	*-----	*-----	1 562.06	.3780
67	5-23-38	16 028	736	562	76.30	763	.226	17 785	5.270	*-----	*-----	*-----	*-----	2 614.74	.7752
67	5-23-38	16 137	736	676	91.80	918	.226	22 002	5.420	*-----	*-----	*-----	*-----	779.20	.1921
67	4-22-38	16 959	736	716	97.30	743	.172	22 605	5.260	*-----	*-----	*-----	*-----	324.86	.0756
67	4-22-38	15 771	736	536	72.80	614	.190	17 861	5.550	*-----	*-----	*-----	*-----	2 478.03	.7698
71	8- 3-37	22 252	596	560	94.00	442	.132	22 876	6.800	168.00	92.00	684.00	1 222.00	2 505.00	.7449
71	8- 3-37	22 226	680	650	95.60	436	.114	30 386	7.790	100.00	10.00	542.00	1 531.00	2 427.00	.6223
71	5- 2-39	4 094	373	345	92.50	550	.266	28 816	13.914	144.00	293.00	735.00	986.00	3 111.00	1.5022
71	5-25-39	3 888	336	328	97.60	631	.321	28 789	14.643	118.00	60.00	684.00	1 161.00	3 406.00	1.7325
74	12-16-38	12 215	736	664	90.30	395	.099	24 558	6.200	*-----	*-----	*-----	*-----	1 285.76	.3226
74	12-27-38	10 251	736	651	88.30	850	.217	24 039	6.200	*-----	*-----	*-----	*-----	1 340.88	.3437
74	12-27-38	10 300	736	645	87.70	930	.240	23 841	6.200	*-----	*-----	*-----	*-----	1 357.51	.3506
75	8- -38	12 245	440	440	100.00	765	.290	18 335	6.940	*-----	*-----	1 754.00	3 596.00	5 350.00	2.0257
75	6- -38	15 403	616	527	85.50	591	.160	20 234	5.470	*-----	*-----	2 965.00	3 213.00	6 178.00	1.9538
TOTAL		443 331	17 899	15 943		20 068		645 053		$2 415.38	$ 796.13	$10 717.86	$17 708.32	$ 68 554.82	
Average		16 419	661	590	89.27	743	.2097	23 891	6.7432	241.54	79.61	893.15	1 475.69	2 539.06	$ .7166
1000 HP															
6	12- -39	4 304	736	662	90.00	589	.148	29 411	7.400	$ *-----	$ *-----	$ *-----	$ *-----	$ 1 012.67	$ .2548
6	12- -39	4 066	736	708	96.00	600	.141	29 454	6.900	*-----	*-----	*-----	*-----	595.54	.1402
6	11- -39	4 428	736	632	86.00	577	.152	23 718	5.400	*-----	*-----	*-----	*-----	690.69	.1820
6	6- -39	8 496	736	682	93.00	147	.035	26 625	6.500	*-----	*-----	*-----	*-----	642.33	.1570
6	6- -39	8 402	736	570	77.00	166	.048	25 195	7.300	*-----	*-----	*-----	*-----	649.74	.1899
6	6- -39	8 199	736	706	96.00	124	.029	32 026	7.600	*-----	*-----	*-----	*-----	411.26	.0972
6	6- -39	8 564	736	675	92.00	162	.040	25 070	6.200	*-----	*-----	*-----	*-----	402.49	.0995
6	6- -39	8 170	736	696	95.00	155	.037	28 845	6.900	*-----	*-----	*-----	*-----	323.75	.0775
6	6- -39	8 906	736	697	95.00	142	.033	29 560	7.100	*-----	*-----	*-----	*-----	661.68	.1583
6	7- -39	6 637	736	634	87.00	601	.182	22 014	5.700	*-----	*-----	*-----	*-----	940.77	.2474
6	7- -39	7 198	736	661	90.00	709	.173	23 944	6.000	*-----	*-----	*-----	*-----	1 124.66	.2835
6	8- -39	7 347	736	657	89.00	968	.246	24 420	6.200	*-----	*-----	*-----	*-----	1 666.72	.4227
6	8- -39	5 914	736	717	98.00	596	.138	27 573	6.400	*-----	*-----	*-----	*-----	570.52	.1327
6	8- -39	6 540	736	639	87.00	868	.226	26 226	6.800	*-----	*-----	*-----	*-----	1 174.36	.3062
6	8- -39	7 346	736	622	85.00	710	.190	24 395	6.500	*-----	*-----	*-----	*-----	858.90	.2302
49	10- 3-37	19 154	736	654	88.84	1 577	.402	30 722	7.830	120.10	122.08	297.41	670.72	1 140.66	.3672
54	8-10-39	7 344	736	684	92.98	655	.160	28 280	6.890	*-----	*-----	*-----	*-----	2 090.05	.5090
54	8-25-39	6 820	736	685	93.09	921	.224	28 698	6.980	*-----	*-----	*-----	*-----	1 873.40	.4557
54	7-18-39	6 946	562	528	94.07	250	.079	20 552	6.480	*-----	*-----	*-----	*-----	1 204.28	.3799
54	4-29-39	9 540	736	718	97.55	1 003	1.003	32 250	7.490	*-----	*-----	*-----	*-----	1 400.69	.3251
54	4-29-39	9 299	736	696	94.57	399	.096	28 939	6.930	*-----	*-----	*-----	*-----	1 359.48	.3255
54	3-29-39	1 458	736	670	91.06	1 497	.372	32 562	8.100	*-----	*-----	*-----	*-----	2 832.97	.7045
65	6- 2-39	8 832	736	658	89.40	663	.168	27 394	6.940	*-----	*-----	*-----	*-----	1 097.79	.2782
71	9-25-39	6 077	684	624	91.20	440	.114	25 973	6.930	208.00	77.00	687.00	877.00	2 058.00	.5497
71	11-17-39	4 493	718	665	92.60	493	.120	30 022	7.520	172.00	65.00	797.00	116.00	1 375.00	.3448
71	9-13-39	6 078	713	694	97.30	280	.066	32 783	7.870	180.00	a39.00	448.00	127.00	925.00	.2222
74	10-10-39	6 193	736	725	98.60	614	.141	27 993	6.400	*-----	*-----	400.46	365.66	766.12	.1760
74	10- 4-39	6 329	736	720	97.90	490	.113	27 674	6.400	*-----	*-----	612.33	542.99	1 155.32	.2672
75	6- -39	7 631	546	546	100.00	546	.170	29 546	9.030	*-----	*-----	1 521.00	1 615.00	3 136.00	.9584
75	5- -39	6 040	503	503	100.00	524	.170	30 365	10.650	*-----	*-----	445.00	703.00	1 148.00	.3805
111	*-----	*-----	596	578	97.00	427	.123	35 170	10.140	*-----	*-----	*-----	*-----	723.04	.2084
TOTAL		216 751	21 983	20 306		17 893		867 399		$ 680.10	$ 225.08	$ 5 208.20	$ 5 012.37	$ 36 311.88	
Average		7 225	709	655	92.36	577	.1468	27 981	7.1198	170.02	56.27	651.03	626.55	1 171.35	$ .2981

NOTES.- *Information not available. aCredit.

design and construction of the standard globe and angle valves with a view to incorporating any changes which it is felt would improve the serviceabilty, and at the present time has the following recommendation to make.

Fit Between Disc and Stem

To provide for closer tolerances on the fit between disc and stem in order to avoid any excessive looseness, and between body and bonnet, certain changes in dimensions of these parts have been made, which are included on revised pages F-155, 157, 159, 161, 165, 167 and 169 of the Manual now submitted for approval. These changes will reduce the clearances between stem and disc nut, end of stem and bottom of disc, and body and bonnet, and will effectively improve the fit of the bonnet, stem and disc assembly.

The committee is studying certain other changes but is not prepared to report further at this time.

Roller Bearings for Steam Locomotives and Tenders

The sub-committee has continued to assemble information as to roller bearing applications to steam locomotives and tenders during 1940, and has obtained further information and experiences from roads using such bearings.

[The report included, in addition to the data on applications shown in Table V, a detailed tabulation of bearing service

Table IV—Operating Cost of Diesel-Electric Road Locomotives—Six-Month Period Ending December 31, 1940

Road Index	Placed in Service	Miles Prior to 7- 1-40	Miles Assigned Average per Month	Miles Operated Average per Month	Per Cent of Assignment Operated	GALLONS LUBRICATING OIL Total	GALLONS LUBRICATING OIL per Mile	GALLONS FUEL OIL Total	GALLONS FUEL OIL per Mile	COST OF REPAIRS Electrical Equipment Labor	Electrical Equipment Material	Diesel Equipment Labor	Diesel Equipment Material	TOTAL (Diesel Electric Mechanical)	Repair Cost per Mile
600 HP															
49	6-11-35	1 184 551	17 357	17 212	99.16	1 267	.0123	49 913	.4833	$ 327.02	$ 322.92	$ 1 216.30	$ 1 594.24	$ 5 895.56	$.0571
49	7- 1-40	1 209 817	17 357	17 236	99.30	1 146	.0111	48 806	.4719	711.50	1 052.16	2 205.70	1 937.83	8 166.14	.0790
TOTAL		2 394 368	34 714	34 448		2 413		98 719		$ 1 038.52	$ 1 375.08	$ 3 422.00	$ 3 532.07	$ 14 061.70	
Average		1 197 184	17 357	17 224	99.23	1 207	.0117	49 360	.4776	519.26	687.54	1 711.00	1 766.04	7 030.85	$.0680
660 HP															
52	12- -37	386 653	12 178	11 984	98.41	843	.0117	38 531	.5359	$ 87.17	$ 290.57	$ 2 149.88	$ 414.54	$ 4 255.24	$.0588
52	6- -35	823 506	14 760	14 743	99.88	1 042	.0118	52 546	.5941	362.71	139.42	2 094.79	1 766.04	7 123.06	.0805
52	6- -35	807 718	14 585	14 518	99.54	1 350	.0155	52 209	.5994	366.54	508.73	2 041.19	355.86	5 011.49	.0575
TOTAL		2 017 877	41 523	41 245		3 235		143 286		$ 816.42	$ 938.72	$ 6 285.86	$ 2 511.38	$ 16 399.79	
Average		672 626	13 841	13 748	99.33	1 078	.0131	47 762	.5790	272.14	312.91	2 095.29	837.13	5 453.26	$.0661
1000 HP															
54	11-28-39	92 861	3 220	3 040	94.40	615	.0336	49 791	2.7300	$ *-----	$ *-----	$ *-----	$ *-----	$ 7 664.38	$.4202
54	11-29-39	54 452	2 248	1 777	79.04	984	.0910	42 964	4.0300	*-----	*-----	*-----	*-----	5 493.99	.5154
TOTAL		147 313	5 468	4 817		1 599		92 755		$ ----	$ ----	$ ----	$ ----	$ 13 158.37	
Average		73 657	2 734	2 408	88.09	800	.0554	46 378	3.2096	----	----	----	----	6 579.19	$.4553
1800 HP															
6	6- -37	717 243	21 497	21 497	100.00	3 149	.0240	154 824	1.2000	$ 1 229.06	$ 803.35	$ 2 151.38	$ 1 488.66	$ 5 396.96	$.0418
6	6- -37	699 594	21 951	21 951	100.00	3 591	.0270	152 560	1.1500	1 336.07	1 368.42	2 440.11	4 289.82	11 854.78	.0900
6	1- -38	563 262	18 177	18 177	100.00	2 597	.0230	138 770	1.2330	1 481.56	1 507.27	2 109.65	1 346.49	8 612.88	.0790
6	1- -38	555 641	22 065	22 065	100.00	2 540	.0190	160 465	1.2120	1 217.42	1 304.66	2 137.99	1 951.65	8 882.09	.0671
6	3- -38	145 362	24 227	24 227	100.00	2 812	.0190	170 825	1.1750	1 183.59	1 076.94	2 359.96	4 420.92	12 021.13	.0827
6	3- -38	566 686	20 758	20 758	100.00	2 930	.0230	145 574	1.1680	1 141.22	1 754.95	2 218.89	4 739.34	12 893.63	.1035
24	10-21-36	1 283 662	31 479	31 010	98.50	2 917	.0160	175 672	.9500	644.65	303.59	3 758.86	6 654.70	13 477.04	.0724
24	11- 3-36	1 309 189	31 566	31 220	98.90	2 756	.0150	177 820	.9500	588.09	274.34	3 612.56	6 030.16	12 249.16	.0654
24	11-20-36	1 074 064	25 473	25 473	100.00	2 592	.0170	163 167	1.0700	706.75	2 285.29	2 332.42	2 720.45	11 314.21	.0740
24	12- 4-36	1 056 527	25 798	25 798	100.00	2 569	.0170	162 542	1.0500	646.53	1 266.63	2 561.18	1 896.80	10 744.81	.0694
TOTAL		7 971 230	242 982	242 176		28 453		1 602 219		$10 177.94	$11 945.44	$25 683.00	$35 535.99	$107 146.69	
Average		797 123	24 298	24 218	99.67	2 845	.0196	160 222	1.1027	1 017.79	1 194.54	2 568.30	3 553.60	10 714.67	$.0739
2000 HP															
6	9- -39	196 275	24 589	24 589	100.00	3 512	.0240	235 701	1.5970	$ 1 888.42	$ 132.94	$ 4 319.42	$ 5 815.84	$ 14 967.19	$.1014
6	9- -39	184 917	24 147	24 147	100.00	2 730	.0190	189 192	1.3050	1 467.99	908.59	2 603.06	1 813.33	9 177.23	.0633
51	12- -39	156 273	22 465	21 746	96.70	2 000	.0150	202 452	1.5500	697.68	1 209.08	2 547.92	6 945.19	18 558.53	.1422
51	12- -39	145 951	20 683	20 273	98.00	2 610	.0210	239 598	1.9700	1 658.88	758.66	1 775.20	1 466.51	15 372.23	.1264
71	10-25-39	53 847	14 658	14 519	99.10	1 141	.0170	150 689	1.7300	961.00	430.00	2 070.00	2 582.00	8 985.00	.1031
71	10-24-39	54 014	14 658	14 658	100.00	1 529	.0170	145 512	1.6500	1 034.00	412.00	1 715.00	920.00	6 600.00	.0750
TOTAL		791 277	121 220	119 932		13 822		1 163 144		$ 7 707.93	$ 3 851.27	$15 030.59	$19 542.87	$ 73 660.18	
Average		131 879	20 203	19 989	98.94	2 304	.0192	193 857	1.6164	1 284.66	641.88	2 505.10	3 257.15	12 276.69	$.1024
3600 HP	8-35 &														
1	10-40	772 827	*-----	13 125	----	3 982	.0510	131 938	1.6500	$ *-----	$ *-----	$ *-----	$ *-----	$ 28 307.00	$.3595
130	6-19-39	564 288	34 646	34 347	100.00	19 481	.0940	491 684	2.3860	8 210.10	14 809.99	15 569.44	39 441.43	112 057.87	.5438
TOTAL		1 337 115		47 472		23 463		623 622						$140 364.87	
Average		668 558		23 736		11 732	.0824	311 811	2.1895					70 182.44	$.1928
4000 HP															
26	6- 1-39	290 198	25 904	25 904	100.00	4 416	.028	444 644	2.861	$ 640.00	$ 945.00	$ 3 396.00	$ 8 775.00	$ 23 837.00	$.1534
26	6- 1-39	288 327	25 645	25 645	100.00	5 142	.033	462 572	3.000	832.00	1 848.00	5 417.00	15 601.00	28 169.00	.1831
130	3- -39	257 862	18 110	18 110	100.00	5 924	.055	250 402	2.305	1 071.94	7 226.54	5 133.13	10 651.44	32 939.40	.3031
TOTAL		836 387	69 659	69 659		15 482		1 157 618		$ 2 543.94	$10 019.54	$13 946.13	$35 027.44	$ 84 945.40	
Average		278 796	23 220	23 220	100.00	5 161	.0370	385 873	2.7697	847.98	3 339.84	4 648.71	11 675.81	28 315.13	$.2032

NOTE.- *Information not available.

records showing mileages made by different types of roller bearings, the number and cause of bearing failures and the mileage per failure. The report also included a tabulation of bearing maintenance costs, bearing mileages between failures and axle failures.—EDITOR]

The sub-committee on roller bearings for locomotives and tenders is investigating the standardization of pedestal widths for roller bearings on steam, electric and Diesel freight, passenger and switch locomotives and will cooperate with the Car Construction Committee on similar standardization for pedestal widths on tender roller bearings.

Shelling of Trailer Wheel Tires

In February, 1934, the Locomotive Construction Committee appointed a sub-committee to confer with a technical committee of American tire manufacturers, to study failures of driving and trailer wheel tires on locomotives. A questionnaire was prepared, and data collected from Member Roads.

The study on driving wheel tires was completed and so reported in November, 1937, and Member Roads advised to confine the study, commencing June 1, 1937, to the shelling of trailer tires. The data developed that six roads were having most of the trouble, and at a committee meeting March 9, 1938, this study was confined to the Boston & Maine; Chicago & Eastern Illinois; Great Northern; Louisville & Nashville; Norfolk & Western and Southern.

During December, 1938, a committee was appointed, and visited the shops of these six roads to study shelling and shop practices. Suggestions were made by this committee during its visit. The study was continued up to October 1, 1940.

CONCLUSION

Many of the roads experience no trouble with shelling of non-heat-treated trailer tires, while others have had serious trouble.

This shelling has taken place on particular types of locomo-

Table V—Roller Bearing Applications in the United States and Canada Up to December 1, 1940

	Timken	SKF	ASF	Hyatt	Fafnir	All
Total engine truck bearings applied	2,234	2,278	396	0	0	4,908
Total all driver bearings applied	3,622	518	0	0	0	4,140
Total trailer truck bearings applied	1,258	666	430	0	0	2,354
Total tender truck bearings applied	6,388	4,100	2,340	116	168	13,112
Per cent of total engine truck bearings applied	45.51	46.41	8.08	0	0	.....
Per cent of total driver bearings applied	87.49	12.51	0	0	0	.....
Per cent of total trailer truck bearings applied	53.44	28.29	18.27	0	0	.....
Per cent of total tender bearings applied	48.72	31.27	17.85	0.88	12.81	.....
Per cent bearings reported of total number applied, engine truck	85.58	64.18	50.51	....	....	.....
Per cent bearings reported of total number applied, drivers	90.12	80.31	....	....	....	.....
Per cent bearings reported of total number applied, trailer truck	81.08	70.57	31.16	....	....	.....
Per cent bearings reported of total number applied, tender	96.18	84.39	44.19	100.00	14.28	.....

tives, and in many cases on particular divisions, with locomotives in fast and heavy service.

The record indicates clearly, after approximately four years' study, that the service obtained by the use of heat-treated quenched and tempered) trailer tires has practically overcome the shelling condition, and, in addition, has greatly increased the mileage on tires, as indicated by an average of 22,000 miles per 1/16 in. of wear on heat-treated (quenched and tempered) tires, and an average of 6,800 miles per 1/16 in. of wear on non-heat-treated tires.

This study covered 997 heat treated (quenched and tempered) tires, and 3,972 non-heat-treated tires.

One road made a test of normalized tires, but due to the very poor results obtained, discontinued the purchase.

It is recommended that railroads experiencing trouble due to the shelling of trailer tires use heat-treated (quenched and tempered) tires and follow carefully the Locomotive Tire Manual in the preparation of wheel centers and tires, and the application of tires to the wheel centers.

Locomotive Boiler Construction by Fusion Welding

Since 1935 the Mechanical Division has been following an investigation of the construction of locomotive boilers by the fusion welding process.

At a meeting of the General Committee of the A. A. R. June 25, 1935, action was taken to instruct the Committee on Locomotive Construction to consult with representatives of the locomotive builders and start a preliminary investigation covering the basis of procedure in connection with the subject, and also to include in its study the matter of such tests and research as should be conducted and an estimate of cost.

On October 11, 1935, the committee received a letter from G. S. Edmonds, superintendent motive power, Delaware & Hudson, in which he stated they had for four and one-half years, in collaboration with the American Locomotive Company, been carefully studying and investigating the development of a welded conventional locomotive boiler.

In view of the fact that the D. & H. contemplated building such a boiler, the committee decided to join forces with the locomotive builders and representatives of the welding societies.

A design was developed and presented to J. M. Hall, director Bureau of Locomotive Inspection, Interstate Commerce Commission, with a formal request for permission to proceed with the construction of the boiler. Mr. Hall gave his permission, provided the design of the boiler, specifications and material met the approval of the Committee on Locomotive Construction and also the General Committee. This was all passed upon and approved, and the American Locomotive Company proceeded with construction at its Dunkirk, N. Y., plant, all welding being carefully supervised and X-rayed. Upon completion, it was sent to Chattanooga, Tenn., to be stress relieved, and returned to American Locomotive Company for installation of the firebox and final completion. Hydrostatic and hammer tests were made on March 18, 1937, at the Schenectady, N. Y., plant of the American Locomotive Company. The boiler was then delivered to the Delaware & Hudson and applied to locomotive No. 1219. In order to comply with federal requirements it was used as a stationary boiler for a period of from one month to six weeks for observation and check.

Locomotive No. 1219 was placed in freight service on September 24, 1937, for operation on the Pennsylvania Division of the Delaware & Hudson between Wilkes-Barre and Oneonta, N. Y., a run of 130 mi. The federal requirements stated that in the first year of service the lagging and jacket was to be removed and the joints examined each three months, in the second year each six months, and yearly thereafter for a period of five years. Each time the hydrostatic test was made it was not less than 50 per cent above the working pressure. Following is the report of inspections for the first, second, third and fourth quarters of the first year:

First Quarter: Locomotive No. 1219 was taken out of service at Colonie, N. Y., December 19, 1937, for the first three-months inspection of fusion welded boiler. Jacket and lagging was removed to enable inspection of welded seams. Pressure of 225 lb. was applied and careful inspection made of all welding of shell, wrapper, and firebox sheets of this boiler, and same found in good condition.

Second Quarter: Locomotive No. 1219 was taken out of service at Oneonta, N. Y., March 19, 1938, for the second three-months inspection of fusion welded boiler. Jacket and lagging was removed to enable inspection of welded seams. Pressure of 225 lb. was applied and careful inspection made of all welding of shell, wrapper, and firebox sheets of this boiler, and same found in good condition.

Third Quarter: Locomotive No. 1219 was held at Oneonta, June 18, 1938, for the third three-months inspection of welded seams. Pressure of 225 lb. was applied and careful inspection made of all welding of shell, wrapper, and firebox sheets of this boiler, and same found in good condition.

Fourth Quarter: Locomotive No. 1219 was held at Oneonta, September 17, 1938, for annual test and inspection of fusion welded boiler. Jacket and lagging was removed to enable inspection of welded seams. Hydrostatic test was applied at a pressure of 340 lb. and careful inspection made of all welding of shell, wrapper, and firebox sheets of this boiler, September 20, 1938, and found to be in good condition.

The first semi-annual inspection for the second year of service was made on April 3, 1939, at the Colonie Shops of the Delaware & Hudson, at which time the jacket and lagging was removed to enable inspection of the welded seams in this boiler. A test of 340 lb. pressure was applied and at this inspection it was found that the welding on the shell and wrapper sheets of the boiler and firebox when examined was found to be in good condition. As a matter of fact, since the boiler was first placed in service there have not been any signs of a simmer or leak from any of the welded seams. Up until the time of this inspection the locomotive had approximately 105,000 miles of service.

The second semi-annual inspection in the second year of service was made on November 17, 1939, at Oneonta, N. Y., at which time the jacket and lagging were removed to inspect the welded seams. An hydrostatic test of 350 lb. pressure was applied and careful inspection was made. The welding on shell and wrapper sheets of the boiler and firebox was carefully examined and found to be in good condition. Up to that date there had not been a simmer from any of the welds. The locomotive at that time had 134,000 miles of service.

The first annual inspection of locomotive No. 1219 in its third year of service was made on July 9, 1940, at the Colonie Shops of the Delaware & Hudson in accordance with federal requirements. All conditions of the boiler were found entirely satisfactory.

There will be another inspection for the fourth year of service, probably in July, 1941, and for the fifth year in July, 1942. The committee will continue to follow this matter during the period of inspections required by the I. C. C. Bureau of Locomotive Inspection, and furnish further reports until the conclusion of the test period.

Locomotive Boiler and Firebox Materials and Construction

A questionnaire requesting detailed information on boiler and firebox materials and construction was prepared by the committee and issued to 30 representative railroads and the 3 locomotive builders.

Replies covering 81 classes of locomotives of 15 different types or wheel arrangements have been received and tabulated.

The tabulation shows the latest practice in locomotive boiler construction on the railroads reporting, and the size of the boilers ranges from 73⅝ in. to 103¼ in. inside diameter, first course.

The report contained tabulations of (1) firebox and tube sheet thicknesses; (2) rate of increase in width of water space (a) adjacent to firebox tube sheet, (b) near door sheet; (3) space between crown and roof sheet at back tube sheet and (4) type of threads on fire box end of rigid radial stay bolts, selected to show the trend in design of modern boilers. The figures show a wide variation in practice as to roof and tube sheet thickness and the rate of increase of water space opposite the firebox. The variations appear to be without relation to boiler diameter—used as a basis of comparison.

The information obtained has been tabulated and furnishes a voluminous amount of data on design and construction of modern locomotive boilers, blueprint copies of which can be obtained from the secretary, if desired, at cost of reproduction.

Because of the amount of work and time involved, it has been

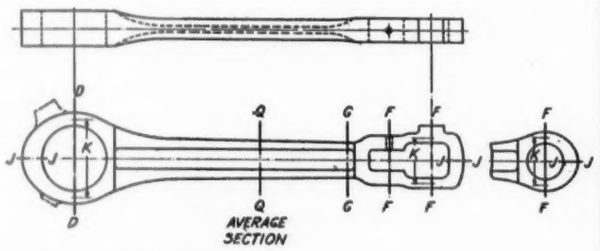
MAIN AND SIDE RODS

S = STRESS IN POUNDS PER SQUARE INCH.
A = NET AREA OF SECTION IN SQUARE INCHES.
P = PISTON THRUST IN POUNDS = AREA OF CYLINDER × BOILER PRESSURE.
B = P ÷ A = LOAD PER SQUARE INCH OF AREA.
L = LENGTH OF ROD BETWEEN PIN CENTERS IN INCHES.
R = RADIUS OF GYRATION OF SECTION IN INCHES.
E = MODULUS OF ELASTICITY OF MATERIAL
h = DEPTH OF SECTION IN INCHES
C = CRANK RADIUS IN FEET
K = SEE SKETCH – INCHES.
Z = SECTION MODULUS OF SECTION

NOTES

1-THE MAXIMUM STRESSES SHOWN ARE FOR CARBON STEEL WITH A TENSILE STRENGTH OF 80,000 LBS. PER SQ. IN., AND A YIELD POINT OF 40,000 LBS. PER SQ. IN. STRESSES MAY BE INCREASED FOR STRONGER STEELS, BUT THE INCREASE SHOULD NOT EXCEED THE PROPORTIONATE INCREASE IN ULTIMATE TENSILE STRENGTH.
2-FORMULA FOR STRESS DUE TO CENTRIFUGAL FORCE IS BASED ON DIAMETER SPEED, EQUIVALENT TO 336 R.P.M. FOR OTHER SPEEDS THE STRESS IS IN PROPORTION TO THE SQUARE OF THE R.P.M., OR THE SQUARE OF THE SPEED IN MILES PER HOUR.
3-LUBRICATION HOLE AND OTHER HOLES SHOULD BE KEPT AT LEAST 30° FROM VERTICAL CENTER LINE.
4-ROD EYES WITH SINGLE BUSHINGS OF THE FLOATING TYPE SHOULD HAVE THE THICKNESS OF METAL INCREASED $\frac{1}{4}$ INCH OVER THAT PROVIDED BY FORMULA TO ALLOW FOR WEAR.
5-LIBERAL RADII SHOULD CONNECT ROD BODIES WITH ENDS.

MAIN RODS

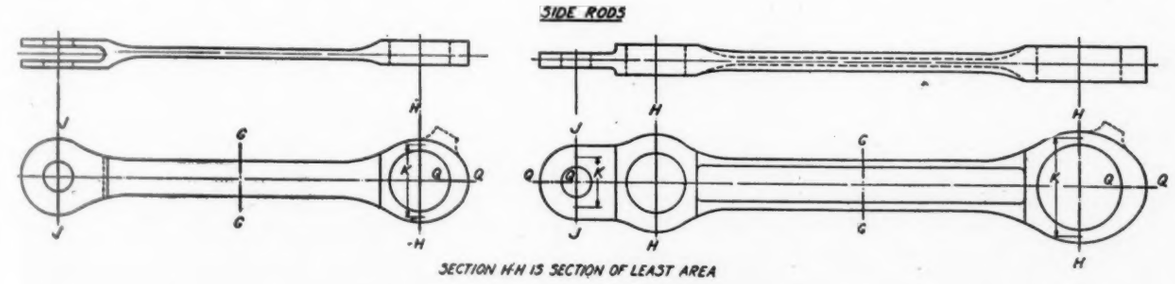


SECTIONS D-D & F-F ARE SECTIONS OF LEAST AREA

SECTION	STRESSES	FORMULAE	MAXIMUM
G-G	① DIRECT STRESS	$S = P \div A$	10,000
Q-Q	② TRANSVERSE BENDING	$S = \frac{B}{1 - \left(\frac{B}{40E} \times \frac{L^2}{R^2}\right)}$	11,000
Q-Q	③ BENDING (COLUMN VERTICAL)	$S = \frac{B \div Z}{1 - \left(\frac{B}{20E} \times \frac{L^2}{R^2}\right)}$	5,500
Q-Q	④ BENDING (CENTRIFUGAL FORCE) NOTE-2	$S = .68\left(\frac{L}{R}\right)^2 \times \frac{h}{2} \times C$	10,000*
Q-Q	⑤ COMBINED VERTICAL BENDING	$S = ③ + ④$	15,000*
F-F	⑥ DIRECT STRESS	$S = P \div A$	7,000
F-F	⑦ BENDING	$S = \frac{P \times K}{20Z}$	20,000
D-D	⑧ DIRECT STRESS	$S = P \div A$	6,000
D-D	⑨ BENDING	$S = \frac{P \times K}{20Z}$	20,000
J-J	⑩ BENDING	$S = \frac{P \times K}{12Z}$	20,000

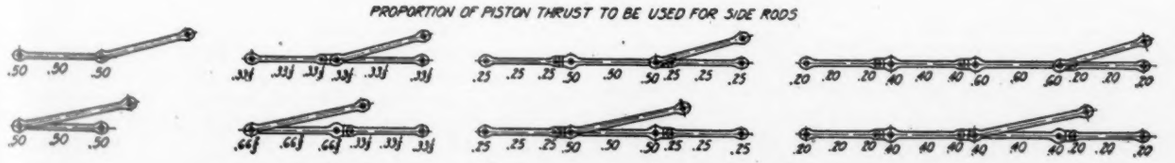
*AT MAXIMUM SPEED

SIDE RODS



SECTION H-H IS SECTION OF LEAST AREA

PROPORTION OF PISTON THRUST TO BE USED FOR SIDE RODS



FOR I SECTION AND RECTANGULAR RODS

SECTION	STRESSES	FORMULAE	MAXIMUM
G-G	① DIRECT STRESS	$S = P \div A$	6,000
G-G	② TRANSVERSE BENDING	$S = \frac{B}{1 - \left(\frac{B}{40E} \times \frac{L^2}{R^2}\right)}$	7,000
G-G	③ BENDING (CENTRIFUGAL FORCE)	$S = .68\left(\frac{L}{R}\right)^2 \times h \times C$	10,000*
G-G	④ COMBINED DIRECT STRESS AND BENDING	$S = ① + ③$	14,000*
H-H	⑤ DIRECT STRESS	$S = P \div A$	4,000
H-H	⑥ BENDING	$S = \frac{P \times K}{20Z}$	16,000
Q-Q	⑦ BENDING	$S = \frac{P \times K}{12Z}$	16,000
J-J	⑧ DIRECT STRESS	$S = P \div A$	4,000
	⑨ KNUCKLE PIN BEARING PRESSURE	$B = P \div A$	4,000

* AT MAXIMUM SPEED

Proposed formulas for stresses on main and side rods

impossible to formulate recommendations in the report this year. The subject will receive further consideration during the coming year.

Research on Axles, Crank Pins and Bearings

An outline of test covering three different methods of making the crank pin fit in the wheel center and methods of converting the axle testing machines at the plant of the Timken Roller Bearing Co. in order to make the crank pin tests have been worked up. Appropriation for making the test has been granted by the Association, and tests will be started as soon as possible after the work of testing car axles is concluded. This will be approximately August, 1941. It is anticipated that a full report on the results of these tests will be ready for the annual meeting in 1942.

Stresses in Locomotive Rods and Motion Work

The committee was assigned the task of revising the Standard Checking Formulas for Main and Side Rods which were adopted in 1914 and are shown on Pages F-9 to 13, inclusive, of the Manual, with the particular purpose of providing designs which will have the required strength without excess weight.

During the progress of the study, many existing designs of main and side rods on various types of locomotives were investigated and analyzed, and the formulas now proposed, with the stress limitations shown, represent the conclusions reached to attain the desired objectives.

An effort has been made to simplify the processes of calculation and the two pages were submitted for inclusion in the Manual as recommended practice to cover all the necessary formulas for main and side rods.

Standardization of Wrought Steel Wheels for Diesel Locomotives

The sub-committee submitted a questionnaire to railroads and manufacturers asking for information in connection with the present design of wrought steel wheels used on Diesel locomotives.

From the data collected, a table of proposed standards was prepared and included in the report of Committee on Wheels, dated May 27, 1940.

This table has been revised to include wheels of 33 in. diameter and appears, in revised form, in Fig. 4.

The committee feels that the standardization of wrought steel wheels for Diesel locomotives is absolutely necessary at this time; further, that there would be no conflict with wheel and axle tests now being conducted by the A. A. R., and it is felt that these proposed standards can be adopted.

It was recommended that they be submitted to letter ballot.

Standardization of Wrought Steel Wheels for Locomotive Trailer Trucks

The sub-committee appointed to investigate and make recommendations on the standardization of the design of wrought steel wheels for locomotive trailer trucks prepared a questionnaire and solicited information from 142 railroads; replies were received from 117 roads.

The tabulation of this data shows 90 different designs of trailer wheels in use with wide variations. A further study of this data is now being made.

Progress is being made on the preparation of a table to show the proposed Standard of Wrought Steel Wheels for Locomotive Trailer Trucks.

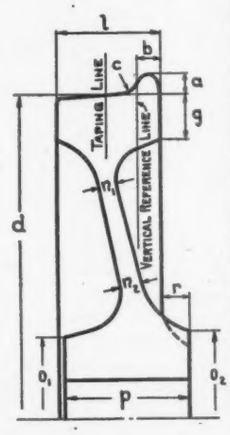
Standardization of Wrought Steel Wheels for Locomotive Tenders

Data was collected by the sub-committee, and a table of proposed standards was prepared. Tentatively, this table was included in Report of Committee on Wheels, dated May 27, 1940.

At meeting of the sub-committee held in New York on January 16, 1941, it was decided to continue the above subject, awaiting the completion of tests of axles and wheels now being conducted on the A. A. R. test machine at the Timken Roller Bearing Company's Plant at Canton, Ohio.

The report was signed by H. H. Lanning (chairman), mechanical engineer, A. T. & S. F.; H. P. Allstrand (vice-chairman), assistant to chief executive officer, C. & N. W.; E. L. Bachman, general superintendent motive power, Pennsylvania; F. E. Russell, mechanical engineer, Sou. Pac.; W. F. Connal, chief mechanical engineer, Can. Nat'l; J. E. Ennis, Engineering assistant, N. Y. C.; J. B. Blackburn, mechanical engineer, C. & O.; L. H. Kueck, chief mechanical engineer, Mo. Pac.; W. H. Sagstetter, chief mechanical officer, D. & R. G. W.; and K. Cartwright, mechanical engineer, N. Y., N. H. & H.

MULTIPLE WEAR WROUGHT STEEL DIESEL LOCOMOTIVE WHEELS



Dimensions With Tolerances.					
Axle Class	5½"×10"	6½"×12" 7"×13" 7½"×14"	6½"×12" 7"×13" 7½"×14"	6½"×12" 7"×13" 7½"×14"	6½"×12" 7"×13" 7½"×14"
Wheel Class	33 I	36 F	38 C	40 C	42 C
a	1" +1/16 -0	Same	Same	Same	Same
b	1 5/32" +1/16 -0	Same	Same	Same	Same
c	11/16" +1/16 -1/16	Same	Same	Same	Same
** d	33" +14 Tapes -0	36" +14 Tapes -0	38" +14 Tapes -0	40" +14 Tapes -0	42" +14 Tapes -0
** g	2½" Min. 3" Min.	Same	Same	Same	Same
l	5½" +⅛ -⅛	Same	Same	Same	Same
*** r1	¾" Min.	¾" Min.	⅞" Min.	⅞" Min.	1" Min.
*** r2	1" Min.	1" Min.	1⅛" Min.	1⅛" Min.	1¼" Min.
* O1	11"	13½"	Same	Same	Same
* O2	11"	13½"	Same	Same	Same
P	6½" or 7" +⅛ -⅛	Same	Same	Same	Same
r	If Rough Machined 1 11/16" +1/16 Min. +3/16 Max.	Same	Same	Same	Same

* Min. Hub Wall 1½".

** Standard Wheels Have Diameters As Shown In The Table With Rims 2½" Thick.

If Rim 3" Thick Is Used The Metal Is Added On The Outside Making The Actual Minimum Diameters 34,37,39,41,43".

*** Wheels Used In Switching Service May Be Specified ⅛" Greater.

Multi-wear wrought-steel wheels for Diesel locomotives

Discussion

In discussing this report, the privilege of the floor was extended to manufacturers of both steam and Diesel locomotives.

R. T. Sawyer, sales engineer, American Locomotive Company, said that the report contains the most comprehensive figures on Diesel locomotive maintenance costs which he has seen up to the present time. He stated that a careful analysis of Alco Diesel locomotive maintenance costs shows that 900- and 1,000-hp. switchers average 29 cents an hour, these locomotives being about two years old. Alco 600-hp. Diesel switchers, which have been in service upwards of four years, are costing 28 cents an hour for maintenance.

L. Richardson, mechanical assistant to vice president and general manager, Boston and Maine, asked the committee what other changes in globe and angle valves for 300 lb. are referred to in the report. Chairman Lanning replied that nothing of great importance was being studied, but the committee were considering a provision for a bonnet bushing and also a valve design for higher temperature and pressure.

J. M. Hall, director, Bureau of Locomotive Inspection, I. C. C., stressed the importance of having good threads on valves, which did not mean valves with threads that only tightened on the last half turn. He spoke of 300-lb. valves of a special material being produced by some manufacturers that will not deteriorate which are well worth the consideration of the Mechanical Division.

E. B. Hall, chief mechanical officer, C. & N. W., asked if the committee took account of the range in carbon content necessary to avoid the shelling of trailer wheels, and said that experience

on the C. & N. W., indicates the probability of trouble with a carbon content above 0.72 per cent.

H. W. Coddington, chief chemical and test engineer, N. & W., said that trouble with trailer tire shelling on the N. & W. did not seem to follow any direct reason, but it was cured by proper heat treatment, the hardness being kept within a range of Brinell 321 to 363. He stated that experience with heat-treated tires on the N. & W. is highly gratifying.

C. B. Bryant, engineer of tests, Southern, said that shelling of trailer tires on this road has been confined to a small group in one territory and that the solution of the problem did not require going to heat-treated tires.

In discussing that part of the report devoted to a fusion-welded boiler, A. G. Hoppe, assistant mechanical engineer, C. M. St. P. & P., called attention to the record of the D. & H. boiler in having stood several weeks of stationary test service, three years of road service and now almost 12 additional months of road service without any indication of distress, or even minor leakage. He suggested that this type of construction may help solve the problem of securing adequate capacity in modern high-pressure steam locomotive boilers and still keep within space and weight limitations without going to the use of high-tensile alloy steels.

Mr. Hoppe mentioned difficulties in designing boiler-shell portions for 285 to 300 lb. pressure and said that in addition to increasing the weight unnecessarily, single- and double-lap riveted seams introduce abrupt changes in boiler section with attendant unsymmetrical design, stress concentrations and the possibility of cracks developing. This is due to mechanical working and also to caustic embrittlement which implies a combination of high stress in conjunction with small leaks of concentrated boiler water having certain chemical characteristics. Repairs to this type of construction not only keeps the locomotive out of service, but reproduces the construction in kind and does not get away from the difficulties.

Mr. Hoppe said that designs have apparently reached the limit of construction with conventional riveted boilers in which severe forming stresses, in conjunction with cold working and heavy calking, intensify stress concentration and are a potential source of difficulty. He urged the immediate need of utilizing welded boiler construction and said that if this cannot be permitted until some later date, the intermediate time should be utilized in preparing rules and regulations to govern the safe construction of fusion-welded boilers.

He also suggested that rules for the proper construction of welded boilers should include the use of modern X-ray testing equipment, stress-relieving furnaces, etc., which will permit going back to low-carbon steel. He said he is not suggesting that fusion-welded boilers be constructed in railroad shops, but that they be purchased from reliable locomotive and boiler manufacturers having necessary modern welding technique and equipment.

John M. Hall, director, Bureau of Locomotive Inspection, I. C. C., said that welding methods, equipment and materials, including the covered electrode, have been vastly improved during the past decade, making possible the D. & H. fusion-welded boiler which was constructed of selected materials, with downhand welding, most carefully supervised and that the boiler was subsequently stress relieved. He said that this boiler has given excellent service to date but this limited experience is not enough to justify letting individual railroads go ahead at will and use boilers constructed by the fusion-welding process. Even on the D. & H. boiler, Mr. Hall said that if a crack develops it will have to be repaired by conventional methods rather than welding, which is a manufacturer's job.

James Partington, manager, engineering department, American Locomotive Company, said that the welded boiler in industry is an established fact and he hoped that all present would live to see welded boilers widely used in railway service. He said that the boiler difficulties mentioned by Mr. Hoppe can be duplicated on other roads. To permit stress relieving any welded boilers it may build, the American Locomotive Company has available a large annealing furnace at Dunkirk, N. Y. Mr. Partington stated that adequate welding rules are now in existence and, in fact, many welded locomotive-type boilers embodying welded construction and utilizing pressures up to 350 lb. are now in use largely in the oil industry. He paid tribute to the ability of railroads to do a greatly improved welding job, as compared with a few years ago, many roads now following the American Welding Society rules for qualifying welders, using covered electrodes, and doing good welding jobs. Mr. Partington said that the riveted boiler has come to a place where it must be improved and the construction of welded stationary boilers carrying up to 2,200 lb. pressure in drums and superheaters shows what can be done. Mr. Partington paid tribute to the American Welding Society and the Boiler Code Committee of the American Society of Mechanical Engineers, which have made a real contribution to the improvement of welding standards and performance.

Chairman Lanning referred to the important but limited amount of information regarding rod stresses, included in the committee report, and said that the formulae presented by Mr. Ennis represents almost two years' work on the part of both railroads and the builders; and these rod designs have been tested and represent the lightest safe weights usable in high-speed service.

C. T. Ripley, chief engineer, Technical Board, Wrought Steel Wheel Industry, expressed appreciation for the opportunity of working with the committee and made a strong plea for greater standardization of steel wheels used in all classes of service. He said that standardization produces a number of definite benefits, such as reduction in unit cost, fewer wheels carried in stock, more prompt delivery and that these advantages are especially important today. Mr. Ripley suggested that, as a preliminary to reducing the great number of steel wheel sizes and types now in use, it would be well worth while for each road to appoint a single competent man to canvass the steel wheel situation on that road, determine how many non-standard wheels are being used and see what can be done to reduce the number. He said, for instance, that in his opinion the 20 standard Diesel locomotive wheel sizes could be readily reduced to five. He suggested that the Locomotive Construction Committee study the subject of trailer hub wheels faces of which there are a great variety of sizes far more numerous than necessary to meet varying strength requirements. Mr. Ripley said there should be a possibility of reducing about 90 of these sizes to 6. He urged that more railroads follow the recommendations of the highly competent Wheel Committee, and any roads which feel it necessary to depart from the standards in particular instances to submit proposed variation to the committee before burdening the railroads and the wheel industry with additional non-standard steel wheels.

Chairman Lanning said that in view of the urgency of the trailer wheel problem, improvements in wheel construction and design will be made available to the Mechanical Division membership by the committee without waiting for the annual meeting. The committee has under consideration the subject of standardizing trailer hub wheel faces, as suggested by Mr. Ripley.

The report was accepted and referred to letter ballot.

Report of Arbitration Committee

During the year Cases 1779 to 1785, inclusive, have been decided and copies forwarded to the members.

Upon recommendation by the Committee on Brakes and Brake Equipment, a new requirement under Rule 3 is recommended for submission to letter ballot, to make mandatory the use of Standard extra heavy air-brake pipe on all cars built new or rebuilt on or after January 1, 1942, account difficulties being experienced due to failure and leakage of light-weight pipe.

With the concurrence of the Committee on Car Construction and Committee on Couplers and Draft Gears, it is recommended that the effective date of Rule 3 requirement prohibiting acceptance from owners of cars equipped with 5-in. by 5-in. couplers, be extended to January 1, 1943, with proviso it is contemplated no further extension beyond this date will be granted.

The modification of Rule 12 is recommended, to provide that joint evidence to be valid must be obtained within two years after date of repairs. It is felt that if original repairs have given satisfactory service for a two-year period, there is no justifiable reason for making correction at expense of initial repairing line.

Upon recommendation by the Committee on Couplers and Draft Gears, a new requirement is added to Rule 18 prohibiting the burning out of key slots in couplers and requiring removal of such couplers when found in service at expense of car owner. The item has also been added to Rule 19 as prohibited repairs to foreign cars. It is felt that such couplers constitute a hazard in service.

New requirements are added to Rule 60, upon recommendation by the Committee on Brakes and Brake Equipment, making mandatory the substitution of improved parts and elimination of certain details of the AB brake equipment when brakes receive periodic attention.

Recommendations are offered for modification of Rules 112 and 120 to permit car owners to request the return of serviceable AB brake equipment from his cars when dismantled on foreign lines. Rule 120 is also modified to harmonize with Rule 112 with respect to returnable items.

Revision of Rule 113 is recommended to provide that the car owner will be responsible for damage or destruction of a private car by fire, explosion or other condition beyond control of delivering line, while located on private tracks belonging to or leased to lessee of car, it being considered inequitable to place responsibility upon delivering line in such cases. A second modification is proposed, to protect the car owner in cases where privately owned cars are damaged or destroyed on the tracks of a non-subscriber road to which the car has been delivered without authority of owner or lessee.

A new requirement is added to Passenger Rule 7 to provide that the failure of roller bearing units, or combination roller bearing and friction bearing units, due to defects or overheating, will be a car owner's responsibility. The maintenance of roller bearings is generally performed by car owner and foreign lines have practically no opportunity to protect themselves against such failures. This recommendation is concurred in by the Committee on Lubrication of Cars and Locomotives.

Studies of the overhead allowance now used in formulating the A. A. R. labor rate are being made and, if it develops that modification is necessary as result of these studies, with the approval of the General Committee the revision will be incorporated in the 1942 Code.

With the exception of the Rule 3 requirement above mentioned, the committee does not feel that any of the modifications included in its report necessitate submission to letter ballot.

All recommendations for changes in the Rules of Interchange submitted by members, railroad clubs, private car owners, etc., have been carefully considered by the committee and, where approved, changes have been recommended.

Attention is again directed to the fact that the Arbitration Committee will not consider questions under the Rules of Interchange unless submitted in the form of Arbitration Cases as per Rule 123.

Freight-Car Rules

Rule 2

The committee recommends that Paragraph (1) of Section (g) of this rule be modified as follows:

Proposed Form: (g) (1) A. A. R. Car Service Rule 14 will apply when transfer or rearrangement of lading is necessary, including application of proper door protection *when car shows evidence from exterior inspection that load has shifted.*

Reason: To clarify the intent.

Rule 3

The committee recommends that effective dates for various requirements in the present rule, as listed below, now set at January 1, 1942, be extended to January 1, 1943:

Section (b), Paragraph (7)—Brake levers: Metal badge plates.

Section (b), Paragraph (8)—Bottom rod and brake beam safety supports.

Section (b), Paragraph (9)—Braking power.

Section (c), Paragraph (11)—Couplers having 5 by 5-in. shanks.

Note.—The committee does not contemplate granting a further extension in effective date of the requirement prohibiting acceptance from owners of cars equipped with 5 by 5-in. couplers, beyond January 1, 1943. This proviso has the concurrence of the Committee on Car Construction and Committee on Couplers and Draft Gears.

Section (c), Paragraph (12)—Couplers, former standard (except type D) or temporary standard having 5 by 7-in. shanks.

Section (j), Paragraph (2)—Journal boxes, repacking of.

Section (t), Paragraph (3)—Application of welded side frames having T- or L-section compression or tension members.

Section (u), Paragraph (4)—Class E-3 cars not to be accepted from owner.

The committee recommends that a new paragraph and note be added to Section (a) of this rule effective January 1, 1942, subject to approval by letter ballot, to read as follows:

Air brake pipe: Extra heavy pipe (except nipples at angle cocks, which should be of standard weight) required on all cars built new or rebuilt on or after January 1, 1942. From owners.

Note.—It is recommended that when brake pipe is renewed on cars built prior to January 1, 1942, extra heavy pipe as above be used.

Reason: To make mandatory the use of standard extra heavy pipe, account difficulties experienced due to failure and leakage of light-weight pipe, as recommended by the Committee on Brakes and Brake Equipment.

The committee recommends that fourth paragraph of Section (c) and Interpretation No. 1 of this rule be eliminated.

Reason: No longer necessary on account of obsolete construction.

The committee recommends that third paragraph of Section (d) of this rule be modified and Interpretation No. 5 eliminated, as follows:

Proposed Form: (d-3) Draft key retainer, A. A. R. Standard, or approved equivalent, or A. A. R. Alternate Standard one-inch diameter hair pin type, required *in all horizontal draft keys (one, two or three key attachment), on all cars. However,* draft-key retainer with *not less than 5/8-in. thickness of head will be accepted on* cars built prior to March 1, 1929, where the underframe construction will not accommodate the *A. A. R. Standard* one-inch thickness of head. From owners.

Reason: To eliminate Interpretation No. 5.

The committee recommends that note following fourth paragraph of Section (t) of this rule, be modified, effective August 1, 1941, as follows:

Proposed Form: (t-4) No change.

Note.—The movement of cars equipped with arch bar trucks must be confined to owner's rails, except that they are acceptable in interchange from owner for loading or for unloading within the same terminal switching district in which the interchange occurs, and providing that cars so interchanged will be immediately returned to owner's rails when loading or unloading is accomplished.

Cars, *locomotive cranes, tenders and derricks,* equipped with arch bar trucks, are acceptable for movement between plants located in the same switching district.

Reason: To clarify the intent.

Rule 4

The committee recommends that Paragraph (1) of Section (h) of this rule be modified, effective August 1, 1941, as follows:

Proposed Form: (h) (1) Tank cars.—Sheets, heads or domes of non-insulated cars, when bent inwardly in excess of 8-in. by 8-in., or equivalent area, or when bent inwardly in excess of ¼-in. in depth regardless of area; however, dents *or cracks* in heads due to former head-block anchorage, *or in sheets due to contact with cradle or saddle blocks,* will be owner's responsibility.

Reason: Damage due to such causes should be the responsibility of car owner.

Rule 9

The committee recommends that first requirement opposite "Wheels and axles, R. and R." in this rule, covering information to appear on repair cards, be modified, effective August 1, 1941, as follows:

Proposed Form: Cast-steel; wrought-steel; 1-W wrought-steel; steel-tired; or cast-iron wheels (whether single-plate *bracketed, single-plate not bracketed,* or double-plate, which must be indicated by letters *"S. P. B.," "S. P. N. B.,"* or "D. P.," *respectively,* in service metal column).

Reason: As recommended by the Committee on Wheels, such information being necessary in connection with studies of cast-iron wheel failures.

The committee recommends that requirement for classification number opposite item of "Brake shoes, applied," be eliminated.

Reason: It is felt this information is no longer necessary on billing repair cards, as the former standard shoe has not been manufactured for several years and is no longer in service. Furthermore, Rule 19 prohibits the application of other than the standard or alternate standard shoes in repairs to foreign cars and Rule 3 prohibits acceptance of cars from owners unless equipped with the A. A. R. Specification shoe.

RULE 12

The committee recommends that second paragraph of this rule be modified and Interpretation No. 1 eliminated, as follows:

Proposed Form: At points where it is impracticable for a railroad company to obtain joint evidence, the evidence of car owner shall *suffice* provided it is *signed only* after *an* actual inspection by *any railroad* representative *designated by the car owner as competent to make such inspection.*

(Vacant.)

Reason: To eliminate the interpretation.

The committee recommends that fifth paragraph of this rule be modified as follows:

Proposed Form: Joint evidence must be obtained within 90 days after first receipt of car home, *but in no case exceeding two years after date of repairs,* and said joint evidence shall not be valid unless used within 16 months from date of issue.

Reason: It is felt that if original repairs have given satisfactory service for a period of two years, there is no justifiable reason for making correction at expense of initial repairing line.

RULE 14

The committee recommends that second paragraph of this rule be modified as follows:

Proposed Form: Facing the B end of car, in their order on the right side of car, wheels, journal boxes and contained parts (*including box lids*), shall be known as R1, R2, R3 and R4, and (etc.—no other change).

Reason: To clarify the intent.

RULE 17

The committee recommends that new last sentence be added to Paragraph (4), Section (c) of this rule, to read as follows:

(c-4) Equipment markings (for couplers, draft gears, etc.) are not required; however, the rules do not prohibit application of such markings by car owner. If car bears previous markings for couplers, in the event of first application of D or E type coupler; or if A. A. R. approved draft gear is applied in place of non-approved or obsolete type of draft gear, and car bears previous markings for latter gears; such markings must be changed to correspond with coupler or draft gear applied (for the particular end, A or B, or both ends, as the case may be) for which a charge of ½-hr. may be made. In event of failure of repairing line to correct markings under such circumstances, defect card shall be issued for ½-hr. labor to cover. *In such cases the words "A. A. R. APPVD. DRAFT GEAR" may be used in lieu of specifying the particular name and type of approved draft gear applied.*

Reason: To eliminate necessity of preparing stencils for the many types of draft gears.

The committee recommends that a new Paragraph (6) be added to Section (c) of this rule (present Paragraph 6 to be relocated as new Paragraph 7), effective August 1, 1941, to read as follows:

(6) *When old style bottom rotary lock lift lever or toggle is found defective on an A. A. R. Standard Type E coupler, repairing line has the option of renewing old style parts in kind or may substitute as correct repair complete new type assembly having the two parts riveted together. In the latter case, full charge may be made and scrap credit allowed for the old style parts removed (see Rule 101 for charges and credits).*

Reason: As recommended by the Committee on Couplers and Draft Gears.

The committee recommends that Paragraph (d) of this rule be modified as follows:

Proposed Form: (d) Bolts substituted for rivets, where rivets are the standard of the car, are considered as improper repairs, except where used in securing ladders, ladder treads, handholds, sill steps and uncoupling lever brackets, *on all cars of all types;* also *proper to use bolts* for securing coupler and draft gear supports on tank cars; *except, that in no case shall bolts be substituted for rivets which pass through the shell* or metal jacket of tank *of tank cars.* The substitution of bolts for rivets, or (etc.—no other change).

Reason: To clarify the intent.

The committee recommends that three new sentences be added to Note 2 following Section (e) of this rule, effective August 1, 1941, to read as follows:

Note 2.—The A. A. R. brake beam with strut designed for third point suspension is an optional A. A. R. Standard and must be maintained in repairs where standard to car. Therefore, substitution of beam without provision for third point suspension constitutes wrong repairs subject to defect card for labor and material. *Sliding chair castings must be transferred from beam removed to beam applied. A brake beam with No. 1656 sliding chair may be applied as correct repairs in replacement of beam having optional design of strut and former type No. 1293-B sliding chair. Material charge is permissible only when sliding chair on beam removed is missing or defective, and where beam with chair casting is standard to car.*

Reason: The former type sliding chair is obsolete and has not been manufactured since 1934.

The committee recommends that new explanatory note be added to Section (i) of this rule, effective August 1, 1941, to read as follows:

Note.—The term "interchangeable as to sill spacing and coupler pocket limits" means that gear applied should preferably be of the same height, width and length as the gear removed. In the substitution of gears the length (including the number of followers required for the type of gear applied) must be such as to properly fit the coupler yoke. Gears applied must conform with draft-sill construction of car and, if practicable, with existing draft-gear supports and guides. Any modification of the sill construction such as cutting or burning of slots for accommodation of transverse spring rods or of holes for accommodation of different design of guides or supports is not permissible.

Reason: To clarify the intent with respect to draft-gear substitution. This recommendation has the concurrence of the Committee on Car Construction and Committee on Couplers and Draft Gears.

RULE 18

The committee recommends that Paragraph (1) of Section (a) of this rule be modified as follows:

Proposed Form: (a-1) Couplers, types D and E, with distance between point of knuckle and guard arm exceeding 5 5/16 in. as measured by gage (Fig. A, page 56), must have the defective part or parts renewed to bring coupler within required gage of 5⅛ in. as measured by gage (Fig. C, page 57). If coupler is out of gage, the body must not be renewed unless the application of secondhand, reconditioned or new *lock, or knuckle, or both,* will not bring it within the required gage of 5⅛ in. *Likewise, knuckle must not be renewed unless the application of secondhand, reconditioned or new lock will not bring coupler within the required gage of 5⅛ in.*

Reason: To clarify the intent that, where renewal of parts will correct defective condition, renewal of complete coupler is not justified. This recommendation has the concurrence of the Committee on Couplers and Draft Gears.

The committee recommends that a new Paragraph (2) be added to Section (c) of this rule [present Paragraphs (1) and (2) to be relocated as Paragraphs (1-a) and (1-b)] effective August 1, 1941, to read as follows:

(2) *Burning out of key slots in any type of coupler body is prohibited. When couplers with burned-out key slots are removed for any reason or, if such couplers are found in service, they must be removed at the expense of car owner.*

Reason: Coupler with burned-out key slots constitutes a hazard in service. As recommended by the Committee on Couplers and Draft Gears.

The committee recommends that the caption appearing in Fig. D, Rule 18 reading "Condemning limit for cracks *horizontally inclined,*" be modified to read "Condemning limit for cracks *extending in any direction.*"

Reason: To clarify the intent.

The committee recommends the addition of a new section (d) to this rule, effective August 1, 1941, to read as follows:

(d) *Top Lock Lifters—Type D Couplers. Lock Lifters, No. 1*

or No. 2 which have not been converted to No. 3, may be replaced with lock lifter No. 3 at car owner's expense, whether or not the No. 1 or No. 2 is defective.

Reason: As recommended by the Committee on Couplers and Draft Gears, to prevent couplers from opening in service.

Rule 19

The committee recommends that a new item be added to this rule (which specifies materials that must not be used in making repairs to foreign cars), effective August 1, 1941, to read as follows:

Coupler body having burned-out key slots.

Reason: Coupler with burned-out key slot constitutes a hazard in service. As recommended by the Committee on Couplers and Draft Gears.

The committee recommends the effective date for eleventh item under this rule, now set at January 1, 1942, be extended for one year, to read as follows:

Welded cast-steel truck side frames having T- or L-section compression or tension members, on and after January 1, *1943.*

Reason: To harmonize with extension recommended under Rule 3.

The committee recommends the addition of a new item to this rule, effective August 1, 1941, to read as follows:

Lock lifters, top, Type D, No. 1 or No. 2 (which have not been converted to No. 3.)

Reason: As recommended by the Committee on Couplers and Draft Gears.

Rule 23

The committee recommends that effective date of requirement prohibiting the welding of cast-steel truck side frames having T- or L-section compression or tension members, now set at January 1, 1942, be extended to January 1, 1943.

Reason: To harmonize with extension recommended under Rule 3.

The committee recommends that eighth paragraph of Section IV of this rule be modified as follows:

Proposed Form: Couplers: Welding cracks in guard arm and back wall of coupler head in accordance with practice described on pages 479-506 of the 1932 Mechanical Division Proceedings, and including couplers with *cracks extending in any direction but not* beyond the welding limits indicated in Paragraph (c) of Rule 18.

Reason: To harmonize with change in Fig. D of Rule 18.

Rule 32

The committee recommends that Section (2) of this rule be modified as follows:

Proposed Form: (2) *Stop* cock, or valve *for similar purpose,* attached to bottom *cap of bottom* outlet valve *nozzle,* if missing, providing car is stenciled "Valve attached to outlet *cap.*"

Reason: to clarify the intent.

The committee recommends that a new last sentence be added to Paragraph (c) of Section (10) of this rule, effective August 1, 1941, to read as follows:

(c) Train collision, Section (d) shall apply in cases of damage due to locomotive, or locomotive with draft of cars, coupling to train or to draft of cars.

Reason: To clarify the intent.

Rule 44

The committee recommends the addition of new Notes D and E following Paragraph (4-c) of this rule and modification of Interpretation No. 1 thereto, effective August 1, 1941, to read as follows:

Note D—When failure of underframe as described in Paragraph (2), (3), or (4) on cars other than tank cars occurs through old or progressive fracture, or due to failure of cast-steel draft extension on car having two center sills; a joint inspection certificate so indicating, signed by a joint inspector or by two inspectors, one of whom must represent a disinterested railroad, shall constitute sufficient evidence that damage occurred in ordinary handling provided, after investigation, it is found that car was not subjected to unfair handling as provided by Paragraph (a), (b), (c), (e), (f), (h), (i), (j), (m), (n), (O-1) and (q) of Section (10) of Rule 32. Whether or not the labor cost of repairs in such cases exceeds the limits of Rule 120, the car shall be reported to car owner and handled under the provisions of that rule.

Note E—When failure of underframe as described in Paragraph (2), (3), or (4) on cars other than tank cars is discovered when car is in train road haul or upon arrival at terminal and prior to switching, the damage will be considered as having occurred in fair usage and, therefore, car owner's responsibility; provided, however, after investigation it is found car was not subjected to unfair handling as described in Paragraphs (a), (b), (c), (d), (e), (f), (h), (i), (j), (m), (n), (o-1), and (q) of Section (10) of Rule 32, that there is no knowledge or record of the defective condition existing prior to car being placed in such train and that there was no switching of one or more cars in train enroute. Whether or not the labor cost of repairs in such cases exceeds the limits of Rule 120, the car shall be reported to car owner and handled under the provisions of that rule.

Interpretation. (1) Q—Is a brief statement that car was not damaged under any condition prescribed in Rule 32 sufficient to establish the responsibility of car owner?

A.—No. Except as provided in last sentence of Note C, and Notes D and E. Statement must show details of the circumstances under which the damage occurred, so that owner may know how responsibility was determined.

Reason: To more equitably allocate responsibility for failure of center sills.

Rule 59

The committee recommends that a new last sentence be added to first paragraph of this rule, to read as follows:

Proposed Form: Rule 59. Missing centrifugal dirt collectors from cars built or rebuilt prior to August 1, 1929, where such cars are stenciled that they are so equipped. *However, such stenciling is not required on any car equipped with AB brakes, regardless of date built.*

Reason: Centrifugal dirt collectors are a standard part of the AB brake installation.

Rule 60

The committee recommends that Paragraph (f) of this rule be modified as follows:

Proposed Form: (f) All old cleaning marks must be scraped off and painted over with quick-drying paint, preferably black. The place, month, day and year of cleaning and the *railroad or private line reporting marks,* must be stenciled with white paint on the auxiliary reservoir, (etc.—no other change).

Reason: To harmonize with changes made in cuts on pages 124 and 125.

The committee recommends that last sentence in Paragraph (g) of this rule, reading as follows, be eliminated:

Effective January 1, 1935, triple valves applied in repairs to all cars must be equipped with the heavier type graduating springs (piece Nos. 18286 or QT 369), regardless of type in valve removed; for which no additional charge is permissible.

Reason: No longer necessary account covered in the A. A. R. Standard Code of Tests.

The committee recommends that new third and fourth notes be added to Section (1) of this rule, and present first and second notes reversed for easier reference, effective August 1, 1941; the new notes to read as follows:

Note 3.—AB brakes receiving periodic attention on and after August 1, 1941, must have improved parts substituted for those of previous designs and piece numbers. Extra charge will be allowed for the improved type strainer, the COT&S allowance being modified to include value of the other items. The improved type parts referred to are as follows:

Quick-action chamber charging choke Pc. No. 506277 or CV-265.
Brake pipe strainer.....Pc. No. 502904 or CV-232.
Emergency piston spring.....Pc. No. 501006 or CV-227.
Reservoir release valve end plate....Pc. No. 94963 or CV-173.
Wasp excluder barrier in the quick-service vent passage.....Pc. No. 515820 or CV-276.

Note 4.—When AB brakes are given periodic attention, the service portion applied must have had two by-pass check valves (Pc. No. 502140 or CV-250), two springs (Pc. No. 93926 or CV-140), one check valve seat (Pc. No. 502902 or CV-255), and one check valve seat gasket (Pc. No. 93928 or CV-134), removed

and the port drilled to 39/64 in. diameter and suitably plugged, for which no extra charge is permissible.

Reason: As recommended by the Committee on Brakes and Brake Equipment.

RULE 66

The committee recommends that a new last sentence be added to Section (b) of this rule, to read as follows:

(b) All journal boxes shall be jacked; all journal wedges and bearings removed for examination, and renewed where necessary; all boxes cleaned and repacked with properly prepared packing (new or renovated) in accordance with A. A. R. Standard Practice (except the use of the back roll which is optional with repairing company), and car stenciled. Dust guards shall be renewed, when necessary, only where wheels, journal boxes or unit side frames are removed. *Missing or defective dust guard plugs shall be renewed.*

Reason: In all cases where boxes are repacked, these plugs should be used to exclude dirt and cinders from the journal box.

RULE 74

The committee recommends that a new note be added to this rule, to read as follows:

Note.—Wheels condemned under this rule should be shown on repair records as "Vertical Flange" or "Thin Flange," as the case may be, rather than "Worn Flange."

Reason: It is felt this detail information should be available to the car owner.

RULE 94

The committee recommends that third paragraph of this rule be modified, effective August 1, 1941, as follows:

Proposed Form: If the owner elects to dismantle the body or trucks, or both, charge may be made for such material, *the renewal of which* would have been required for the repairs covered by the defect card, but such charge to be confined to the actual material stated on card. *Also, in case of items damaged which could have been repaired, labor charge may be made for such items on basis of labor for straightening or repairing same, but no labor charge is permitted for the R. & R. of any part and* no other labor shall be charged in such cases except insofar as labor is already included in the A. A. R. prices for material.

Reason: As a matter of equity. It is felt car owner is properly entitled to charge labor for straightening or repairing parts which are not damaged beyond repair.

RULE 98

The committee recommends that last sentence of present note following Interpretation No. 2 to this rule be relocated as a new Note 3 following Section (g) of same rule, and modified to read as follows:

Note 3.—Where A. A. R. Standard steel wheel gage indicates less than 2/16-in. service metal from full flange contour requirement, such wheel shall be considered as having full flange contour providing it does not require turning for other reasons.

Reason: To clarify the intent of the rule.

RULE 99

The committee recommends that first paragraph of this rule be modified as follows:

Proposed Form: Rule 99. In no case shall car owner be charged for *two or more* applications of journal bearings if applied within 30 days from initial application at same journal location on same road (etc.—no other change).

Reason: To clarify the intent.

RULE 101

The committee recommends that a new Item 58-B be added to this rule (present Item 58-B to be relocated as new Item 58-C), effective August 1, 1941, to read as follows:

58-B Brake pipe strainer (Pc. No. 502904), net.....$1.08
(To be charged only when this new type strainer is applied in replacement of old style strainer).

Reason: Account change in Rule 60.

The committee recommends that a new Item 134-B be added to this rule, effective August 1, 1941, to read as follows:

134-B Coupler bottom rotary lock lift lever and toggle, riveted assembly, new, A. A. R. type E, single design, net ..... $ 71 .. $ .02

Reason: Account change in Rule 17.

RULE 104

The committee recommends that Section (d) of this rule be modified as follows:

Proposed Form: (d) First application of A. A. R. Standard type "E" 6¼ by 8 in. shank coupler in place of A. A. R. Standard type "D" 6 by 8 in. shank coupler; or of A. A. R. Standard type "E" 5 by 7 in. shank coupler in place of A. A. R. Standard type "D" 5 by 7 in. shank coupler; or of A. A. R. Standard types "D" or "E" in place of former A. A. R. Standard or Temporary Standard couplers where such substitution *provides a total of 2½ in. minimum* side clearance for coupler shank without necessity of altering end of car or spacing of draft members; (etc.—no other change).

Reason: To eliminate confliction with A. A. R. Standard. It is also felt 2½ in. provides sufficient side clearance in such cases. This recommendation is concurred in by the Committee on Car Construction.

RULE 111

The committee recommends that allowance under Item 15 of this rule covering cleaning, lubricating and repairing AB freight brake equipment, be increased from *$7.28 to $7.99;* also, that a new sub-item (9) be added to Section (b) of Item 15 of this rule to read as follows; both changes to become effective August 1, 1941:

(9) Brake pipe strainer (piece No. 502904 or CV-232). To be charged only when this new type strainer is applied in replacement of old style strainer.

Reason: Account change in Rule 60.

RULE 112

The committee recommends that a new item be added to Section J of this rule (for which car owner may request return when cars are dismantled on foreign lines), effective August 1, 1941, to read:

AB brake equipment.

Reason: Car owner is reasonably entitled to return of serviceable AB brake equipment, if desired.

RULE 113

The committee recommends that first paragraph of this rule be modified, effective August 1, 1941, as follows:

Proposed Form: Rule 113. The settlement for a car when damaged or destroyed upon a private track shall be assumed by the railway company delivering the car upon such track; except in the case of a private car damaged or destroyed by or resulting from fire or explosion, or some other condition beyond the control of the delivering line, on private tracks belonging or leased to car owner *or lessee of car,* or while located on the private tracks of a car manufacturing or repair plant under arrangement between car owner and the car manufacturing or repair plant.

Reason: The present rule applies to both railroad and privately owned cars. It is inequitable to place responsibility upon delivering line for such damage when car is on private tracks belonging or leased to lessee of car.

The committee recommends that a new second paragraph be added to this rule, effective August 1, 1941, to read as follows:

When a car of private ownership is damaged or destroyed on the tracks of a road which is not a subscriber to the interchange Agreement of the Association of American Railroads, the subscriber road delivering the car to such non-subscriber road shall be responsible to the owner for damage to or destruction of the car while in possession of the non-subscriber, except where such car had been forwarded to the non-subscriber road by or upon authority of car owner or lessee.

Reason: For protection of car owner, in event car is delivered by a subscriber road to a non-subscriber road without authority of owner or lessee.

Rule 120

The committee recommends that first paragraph of Section (e) of this rule be modified, effective August 1, 1941, as follows:

Proposed Form: (e) If owner authorizes destruction, handling line shall allow credit for all material at A. A. R. scrap prices, less labor cost of destruction. However, owner shall have the privilege of having returned serviceable cast-steel truck side frames, metal truck and metal body bolsters, metal draft arms, friction draft gears, cast-steel yokes, metal ends, *"AB" brake equipment, auto loading devices,* and *refrigerator car circulating fans;* also *tanks,* special castings and valves of tank cars; by attaching to statement of estimated weights a list of such parts with full shipping instructions; such parts to be billed at A. A. R. scrap value plus *7 per cent* for handling, f. o. b. point of shipment.

Reason: Car owner is reasonably entitled to return of such serviceable parts if desired. Handling charge reduced to harmonize with present storehouse allowance.

Passenger-Car Rules

Rule 4

The committee recommends that the effective date of second paragraph of this rule, with reference to equipping all-steel or steel under-frame cars with cardboards or suitable receptacle for the accommodation of defect and joint evidence cards, now set at January 1, 1942, be extended to January 1, 1943.

Reason: The present situation justifies this extension.

Rule 7

The committee recommends that a new last paragraph be added to Section (e) of this rule (which lists owner's defects), to read as follows:

Failure of roller bearing units, or combination roller bearing and friction bearing units, due to defects or overheating.

Reason: Maintenance of roller bearings is generally performed by car owner. Handling line has practically no opportunity to protect itself against such failures. This recommendation has the concurrence of the Committee on Lubrication of Cars and Locomotives.

The committee recommends that a new first note be added to Section (j) of this rule, present Note to be located as Note 2 and modified, as follows:

(New) Note 1.—For each portion of Universal control valve removed from and for each portion applied to any car, the proper designating symbol as determined by the description shown below must appear on billing repair card.

Designating Symbol	*Description*
Eq. P. U-12	*Equalizing portion U-12—Without strainer cap.*
Eq. P U-12-C	*Equalizing portion U-12-C—With improved cylinder cap having hair strainer.*
QAP U-12	*Quick-action portion U-12—Without quick service or strainer, one ball check, body ¾ in. shorter than U-12-B portion.*
QAP U-12-B	*Quick-action portion U-12-B—With quick service and no strainer, two ball checks, body ¾ in. longer than U-12, vertical grooves on each side of body.*
QAP U-12-BD	*Quick-action portion U-12-BD—With quick service and same body as U-12-B and strainer bolted between body and high pressure cap.*

Proposed Form: Note 2.—When *equalizing portion U-12-C* is removed, it should be replaced in kind. If replaced *with equalizing portion* U-12, proper credit must be allowed car owner as outlined in notes following Item 20-C of Passenger Rule 21. In the substitution of *equalizing portion U-12-C* for *equalizing portion* U-12, car owner is not responsible for the betterment of improved cylinder cap unless the *equalizing portion U-12-C* valve is standard to *the* car as indicated by stenciling. The same principle applies when *the quick-action portion* U-12-BD *is substituted by or for quick-action portion U-12-B or quick-action portion U-12.*

Reason: To clarify the intent and simplify the preparation of repair cards. As recommended by the Committee on Brakes and Brake Equipment.

Rule 8

The committee recommends that Section (e) of this rule (which lists delivering line defects) be modified as follows:

Proposed Form: (e) Journal cut, or requiring reconditioning due to heating, on *friction bearing units;* axles bent; or axles damaged as provided in paragraph (a). When necessary to true up axles in cases of cut journals, if journal is reduced below the limit as prescribed in Rule 7 (e), axle must be changed at the expense of the delivering line.

Reason: Account change in Section (e) of Passenger Rule 7.

Rule 21

The committee recommends that second, third and fourth notes under Item 20-C of this rule be modified as follows:

Proposed Form: Note.—When *quick-action portion U-12* valve is removed and *quick-action portion* U-12-B valve applied, additional charge of $85.00 is proper versus car owner for betterment cost of converting. Likewise, when *quick-action portion* U-12-B is removed and *quick-action portion* U-12 valve applied, car owner must be allowed credit of $85.00. The quick-action or emergency portion of the U-12-B equipment can readily be distinguished from the U-12 type by its having two ball check caps on top of this portion instead of one cap as on the U-12 type; also, by having a vertical groove on each side of its body.

Note.—When *equalizing portion U-12-C* is removed and *equalizing portion U-12* applied, car owner must be allowed credit of $25.39.

Note.—When *quick-action portion* U-12-BD valve is removed, and *quick-action portion U-12-B* applied, car owner must be allowed credit of $23.30.

Reason: To clarify the intent and simplify the preparation of repair cards. As recommended by the Committee on Brakes and Brake Equipment.

The report was signed by J. P. Morris (chairman), general mechanical assistant, A. T. & S. F.; J. A. Deppe (vice-chairman), superintendent car department, C. M. St. P. & P.; W. H. Flynn, general superintendent motive power and rolling stock, N. Y. C.; L. Richardson, mechanical assistant to vice-president and general manager, B. & M.; G. E. McCoy, assistant general superintendent car equipment, Can. Nat'l; W. R. Elsey, general superintendent motive power, Pennsylvania; A. E. Smith, vice-president, Union Tank Car Company, and M. F. Covert, general superintendent of equipment, General American Transportation Corp.

The report was accepted.

Prices for Labor and Materials

In order that the rules may currently provide an equitable basis for inter-road billing, your committee has continued the work of analyzing material, labor and new equipment costs in A. A. R. Interchange Rules 101, 107, 111 and 112 of the Freight Car Code, and Rules 21 and 22 of the Passenger Car Code, with a view of determining and recommending necessary changes to be made in the next supplement to the current Code.

Rule 101

All miscellaneous material prices in Rule 101 were rechecked as of March 1, 1941, quotations submitted by the purchasing agents of the ten selected railroads, representing thirty-nine per cent of total freight car ownership in the United States and Canada, showing a slight upward trend in material markets as indicated by detail recommendations for revisions shown under this rule.

As announced in the 1940 report, a study was made through the Purchases and Stores Division, on 19 selected railroads representing all portions of the United States and Canada, covering the last six months of 1939, with respect to allowance for store expense used in the make-up of A. A. R. material prices. The result of this study showed a weighted average of the total store

expense for the nineteen railroads of 6.71 per cent; and, as result thereof, the 10 per cent allowance formerly used in computing A. A. R. material prices was reduced to 7 per cent effective January 1, 1941. Question having been raised as to whether the period studied was entirely representative, a further study is under way on the same railroads covering the entire year of 1940. If further modification is found necessary as result of this extended study, revision will be made and included in the rules effective January 1, 1942.

The penalty price for the former standard pressed-steel box lid has been abrogated, and new price is recommended on basis of current market quotations. The former specification lid continues in use to a considerable extent and is considered satisfactory in service by a number of railroads. In view of this situation, it is felt the lid should stand on its merits insofar as A. A. R. material price is concerned.

Item 105-B has been clarified to definitely indicate the allowance includes material for lumber.

Item 188-D is modified to provide additional material charge for doors constructed wholly or in part of high-tensile steel.

Recommendation is made that the average credit allowance for the No. 2 brake beam in Item 210 be reduced to scrap value, with corresponding reduction in the new and secondhand prices. Few railroads are reclaiming this type of beam and the parts cannot be used in reclamation of No. 2-plus or No. 15 brake beams. This recommendation has the concurrence of the Arbitration Committee and the Committee on Brakes and Brake Equipment.

Rule 107

As stated in the 1940 supplementary report, your committee conducted time studies in the field of a considerable number of additional labor operations and, where adjustments were found necessary, modifications were made in the rules effective January 1, 1941.

New note added to Item 22 to clarify the intent with respect to charge for brake hanger renewed in connection with R. & R. or R. of wheels, bolsters and truck sides.

First note following Item 48 modified to eliminate confliction with note following Item 45.

Third note following Item 126 modified to clarify the intent.

Items 142 and 143 modified and new third note added to Item 143, to clarify the intent that allowances for application of running boards in Items 138 to 143, inclusive, apply to covered hopper cars as well as house cars.

New Item 323-A added and Item 325 modified, to eliminate confliction between Items 267, 323 and 325.

Rule 111

New note added to Item 13, to clarify the intent that the charge includes all labor and material for triple-valve parts, except material for triple-valve body.

Rule 112

Recommendations are made in this rule respecting reproduction pound prices of new freight cars of all classes, in order that Supplement of August 1, 1941, may reflect 1940 costs in lieu of figures shown in the present Code. New prices recommended are based on costs of 41,279 freight cars constructed during the year 1940.

Passenger Car Rule 21

Items 10 and 11 modified to include reference to "express" and "combination mail and express" cars. Third and fourth operations listed under Item 20-C modified to clarify.

Passenger Car Rule 22

Material prices were rechecked on basis of quotations as of March 1, 1941, showing a slight upward trend on a few items as indicated by detail recommendations for revisions shown under this rule.

Item 49 and note following modified to provide charge for service metal in excess of 27/16 in. on wheels of nominal 36 in. diameter.

It is the intent of the committee to investigate labor and material costs again in October and if sufficient change develops, necessary revisions will be made and inserted in the Rules effective January 1, 1942.

[The changes recommended in the existing rules are shown in detail in the report.—Editor.]

The report was signed by A. E. Calkins (chairman), superintendent of equipment, N. Y. C.; A. E. Smith (vice-chairman), vice-president, Union Tank Car Company; J. D. Rezner, general car foreman, C. B. & Q.; P. Kass, superintendent car department, C. R. I. & P.; T. J. Boring, general foreman, M. C. B. Clearing House, Pennsylvania; H. H. Boyd, assistant chief motive power and rolling stock, C. P.; and A. H. Gaebler, superintendent car department, General American Transportation Corporation.

The report was accepted.

Report on Tank Cars

During the past year the committee considered a total of 421 dockets and applications for approval of designs as follows: 278 applications covered designs, materials and construction of 5,617 new shipping containers, for mounting on new cars or for replacement on existing cars.

Six applications covered 12 multiple-unit cars to be used for the transportation of 15 Class I. C. C.-106-A-500 one-ton containers. One application covered one new car structure on which would be mounted a reconditioned tank. One hundred and one applications covered alterations in, additions to or conversions and reconditioning of 1,147 existing tank cars or shipping containers.

Thirty-four applications requested approval of tank-car appurtenance designs, without reference to specific cars.

I. C. C. Specifications for Welded Tank-Car Tanks

Recommendations, previously made to the Interstate Commerce Commission, covering a general revision of the commission's specifications for riveted and forge-welded tank-car tanks to be mounted on or to form part of a car were considered at public hearing held in Washington, D. C., on August 8, 1940. By Order, dated August 16, 1940, the commission made effective January 7, 1941, revised specifications as recommended by your committee.

At public hearings before the Interstate Commerce Commission, during September, 1934, your committee recommended the adoption of specifications, then presented, for tank-car tanks fabricated by means of fusion welding. Recommendation was also made that authority be granted for the use of such tanks, for the transportation of articles classed as dangerous.

To obtain experience with respect to the suitability of tank-car tanks fabricated by means of fusion-welding for the transportation of dangerous articles, the commission, following the September, 1934, hearings and to satisfy specific requests, authorized a total of 1,085 such tanks for use in experimental service trials. The commission's several authorities required owners or operators of any tanks so built and placed in service to render periodic reports covering their condition as determined by inspection.

At the August 8, 1940, hearings, your committee reiterated its 1934 recommendation and supplemented this by report that, of the 1,085 tanks authorized, 491 had been constructed and placed in service. Further, these latter, during 18,047 trips, had traversed a total of 15,292,789 miles without failure of any fusion-welded seam.

With this experience record to sustain it, the commission, by its Order of August 16, 1940, incorporates in its revised regulations, effective January 7, 1941, specifications, as recommended by your committee, for fusion-welded tank-car tanks. Authority is also granted for the use of these in substitution for comparable riveted or forge-welded tanks in the transportation of dangerous articles.

A. A. R. Specifications for Tank Cars

Revision of Interstate Commerce Commission specifications for tanks to be mounted on or to form part of a car, as outlined in the foregoing, has necessitated a general revision of the A. A. R. specifications for tank cars. Distribution of copies of these revised specifications will shortly be made to all interested parties.

As indicated by your committee's last previous report, Ap-

pendix A to United States Safety Appliances hand book, last revised during 1920, lacks requirements for appliances now installed on tank cars to meet demands of shippers and their customers. To overcome this deficiency a proposed Appendix B is being formulated. While all items of the latter have not been disposed of, your committee reports progress.

The report was signed by F. Zeleny (chairman), engineer of tests, C. B. & Q.; W. C. Lindner (vice-chairman), chief car inspector, Pennsylvania; G. S. Goodwin, mechanical engineer, C. R. I. & P.; A. G. Trumbull, chief mechanical engineer, C. & O.; B. M. Brown, assistant general superintendent motive power, Sou. Pac.; R. D. Bryan, engineer car construction, A. T. & S. F.; G. A. Young, professor of mechanical engineering, Purdue University; A. E. Smith, vice-president, Union Tank Car Company; W. C. Steffa, transportation manager, Sinclair Refining Company; R. T. Baldwin, secretary, The Chlorine Institute, Inc.; H. J. Gronemeyer, supervisor car equipment, E. I. du Pont de Nemours & Company, Inc.; and R. W. Thomas, manager, special products department, Phillips Petroleum Company.

The report was accepted.

Report on Loading Rules

The annual report of the Committee on Loading Rules for the year 1941 is more condensed than in the past for the reason that it is no longer necessary to submit the recommendations of the committee to letter ballot, this permitting the publishing of supplements to the loading rules in advance of the annual meeting. This is a distinct advantage to both railroads and shippers.

The numerous changes and additions made in the last year were necessitated by the rapid changes being made in the shipper's methods of loading, increased speed in train handling and the growing need for new figures covering commodities not previously contained in the rules. All of the approved methods contained in both Supplements Nos. 1 and 2 to the current rules were adopted only after being followed as experimental loads and their value determined.

During the past year, meetings were held with the steel fabrication shippers, creosote pole shippers, rail shippers, farm equipment shippers, cast iron pipe shippers, wrought iron pipe shippers, as well as our annual meeting with representatives of the steel industry. In all, a total of 43 such meetings were held during the year.

Included in this report, as Appendix A, was a summary of the disarranged load reports received from carriers during the six months period ended December 31, 1940. While the summary indicates an increased number of reports received over the first six months of 1940, there are still a number of carriers who are not reporting failures, and a still greater number who are only reporting a small percentage of them. A report similar to that which is shown on Page 2 of Supplement No. 1 of the Loading Rules should be prepared for every open top load which requires adjustment enroute. The summary showing the loads which were disarranged either in "Train Handling," "Yard Switching" or "When received in Interchange," clearly indicates the need for closer inspection on the part of the mechanical department at originating points and enroute, as well as more care on the part of the transportation department in the handling in trains and in the yards.

In connection with the National Defense Program, the committee was instructed last November, to formulate a code of rules for the loading of mechanized and motorized units and major calibre guns for the United States Army and Navy. This necessitated a number of conferences by designated members of the committee with army officers at posts in the Mid-West, South and in the East. It was necessary to secure information and measurements to enable them to prepare specifications and drawings to cover the various units to be loaded on open top equipment. A special supplement containing a set of general rules, specifications and 23 drawings has since been submitted to the War Department at Washington, approved, published and distributed to all army posts and to the carriers. Having in mind that loading methods which would require the use of special tools, a number of various sizes of lumber, bolts, rods, etc., would not be desirable when loading for combat movement, the committee standardized on blocking insofar as possible, eliminating the necessity for using rods, bolts, etc., and prepared the rules in such a manner that only tools common to all army posts are required for loading. A train of army equipment was blocked in accordance with the proposed methods at Fort Knox, Kentucky, and subjected to unusual handling conditions without any disarrangement of lading or securement. The units forwarded from Fort Knox to Washington for the inaugural parade were loaded in a like manner and no trouble was experienced in either direction.

[The details of changes in General Rules Nos. 4, 5, 9, 15, 16, 18 and 21 which were not included in the last annual report but are now effective, having been published in Supplements Nos. 1 and 2 were included in the report.—EDITOR]

The report was signed by W. B. Moir (chairman), chief car inspector, Pennsylvania; C. J. Nelson (vice-chairman), superintendent interchange, Chicago Car Interchange Bureau; R. H. Dyer, general car inspector, N. & W.; H. S. Keppelman, superintendent car department, Reading; T. W. Carr, superintendent rolling stock, P. & L. E.; A. H. Keys, district master car builder, B. & O.; H. H. Golden, supervisor, A. A. R. Interchange and Accounting, L. & N.; H. T. DeVore, chief interchange inspector, Youngstown Car Inspection Association; H. J. Oliver, general car inspector, D. T. & I., and F. G. Moody, master car builder, Nor. Pac.

Discussion

A member, referring to the general rule in the special supplement containing rules governing the loading of mechanized and motorized army equipment which stated that cars loaded in accordance with these specifications must not be handled in hump switching, thought that this particular rule penalized the railroad. Chairman Moir stated this rule was included as a precautionary measure only in order to prevent damage to equipment such as artillery caused by the impact of cars coupling at a speed of eight to ten miles an hour.

The report was accepted.

Report on Wheels

Through the courtesy of the Association of Manufacturers of Chilled Car Wheels, your committee has been furnished a list of the commercial manufacturers of cast-iron wheels that are subject to the association's recommended practices and inspection.

It is gratifying to note all the commercial wheel plants with the exception of two manufacturers in the states and two in Canada are taking advantage of the facilities offered through the association for developing an improved wheel product.

Grinding of Cast-Iron Wheels

As more attention is given to grinding of cast iron wheels it is desirable that recommendation be made as to some means by which the wheel-shop forces can identify wheels suitable for the grinding process without reducing the chill portion of the tread beyond serviceable limits.

In recognition of this requirement, your committee has outlined methods of procedure presented as Appendix A. In this recommendation, two methods are suggested; one refers to the relationship of tape sizes to available service metal while the second, or alternate, is confined to measurements as established by a modification of the tread-worn-hollow remount gage. In the application of this gage, two suggestions are made; one relates to removing $\frac{1}{16}$-in. from the end of the projection on the gage, the other suggests that the standard gage may be used by applying a $\frac{1}{8}$-in. liner under the surface that contacts the crest of the flange.

If experience with these two processes confirms the opinion of the committee that this is a reliable means for the selection of wheels for grinding, then the methods as outlined in Appendix A should be inserted in the Wheel and Axle Manual.

Request has come from a member road that manufactures a portion of its own cast-iron wheels, asking if it would be acceptable to show the road's initials and place of manufacture as a means of identification for such wheels.

The committee sees no reason why such a procedure is not satisfactory so long as the abbreviations used would not be confused with any existing markings.

In the 1939 report there was submitted a statement regarding the determination of chill by instrumental methods. Further investigation along this line indicated that additional studies would have to be made before it would be consistent to make any definite recommendations.

Your committee has been advised by the Association of Manufacturers of Chilled Car Wheels that it has found the instrumental measurement of chill is not only practical, but is the most reliable means of determining this condition. The committee solicited a comment from the A. M. of C. C. W. on this subject, an abstract of which follows.

Determination of Chill Depth by Instrumental Hardness

Several years ago, the chilled wheel industry began to experiment with the use of instrumental chill determination in an effort to obtain more reliable chill measurement. A number of worn through chilled wheels were given a careful examination in order to get the exact physical and chemical characteristics of the chill that was wearable and also chill that had been accepted as wearable, but had failed to perform satisfactorily in service.

It is generally known that hardness values in iron can be directly related to combined carbon contents, and in this case it was found that areas in worn through chilled wheels invariably contained free carbon in excess of one-half of one per cent. It was also found that when this amount of free carbon was present, the hardness would be less than 55 Scleroscope or 363 Brinell.

This then formed the basis for setting up the first instrumental limits, which were included in A. M. C. C. W. specifications. In the beginning, our Chicago headquarters acted as a referee in questionable cases, and when samples were sent in for check, it was the practice to determine the hardness with a Brinell, Scleroscope, and Rockwell and in addition, obtain chemical analysis for total and free carbon every ⅛ in. from the surface of the tread through the limit of wear.

A basis for arriving at maximum instrumental limits is not quite as simple as for the minimum. With low chill we are concerned with wear, whereas high chill involves strength. However, we know where the most vulnerable points are, and here again physical values bear a direct relation to combined carbon.

It is the safe limits for these physical values that instrumental chill measurement is intended to determine.

The first instrumental limits recommended and accepted by our Association have not proven entirely satisfactory. This was not unexpected, but the principle is right, and further experience is perfecting the method to the extent that in the near future all questionable chill will be accepted or rejected by instrument.

There are 20 odd manufacturing companies in the chilled wheel association, and in the beginning, the various companies preferred different types of instrumental machines. Since the inspection is handled by association inspectors, this meant that the specifications must include provisions for each type of machine. At the last committee meeting, a recommendation was made to the industry that it standardize on the Brinell, and this was subsequently approved.

Revised instrumental limits for chill determinations are now included in the A. M. C. C. W. specifications for actual practice. These became effective June 1, 1941. It is hoped that the railroad inspectors will avail themselves of the opportunity to examine the set-up for instrumental testing in all plants from which they purchase wheels.

Identification of Single-Plate Bracketed-Type Wheels

To provide means for identifying single-plate bracketed-type cast-iron wheels from single-plate wheels and in consideration of the advantage this identification marking may be in accumulating data as to the service record of the two types of wheels your committee has recommended to the Arbitration Committee that a symbol be provided for the identification of the single-plate bracketed-type wheel. The single-plate wheel is now identified by the symbol SP. The single-plate bracketed type wheel could be identified by the symbol SPB.

Effect of Cored Hub on Axle Strength

In the 1940 report, reference was made to a test in contemplation to develop the possible influence the coring of the hub would have upon the strength of the axle.

There is no additional information along this line available, but the committee is still carrying the subject in the open docket. Unless some means are provided for accelerated laboratory tests to develop information as to the influence the coring of the hub has upon service of the axle, the rate of development for such information will be extremely slow. The committee earnestly solicits any information that may develop on roads where cored-hub wheels have been applied.

Specifications for Heat-Treated Multiple-Wear Wrought Carbon-Steel Wheels

It has been brought to your committee's attention that Specification M-123-40—Sec. VI-Marking, Par. 12 (a) mentions the AAR-MW marking preceding the other markings specified on the back face of the rim. This arrangement is different from the way the marking paragraph is expressed for multiple-wear, two-wear and one-wear wrought steel wheels where the A. A. R. and wheel-type identifications follow the other identification markings.

Since this difference in arrangement has resulted in a technical question being raised by some material inspectors, your committee has recommended an editorial change made in Specification M-123-40—Sec. VI-Marking, Par. 12 (a) to conform with the similar paragraph in the other wrought-steel wheel specifications wherein the A. A. R. and wheel type identifications follow the other identification markings.

Influence of Contour upon Service of One-Wear Wrought-Steel Wheels

Information has reached your committee that certain private car lines have been investigating the influence of tread contour upon the service of one-wear wrought-steel wheels. The contour change under observation is a deviation from the present standard of 1-in-20 straight taper in favor of the 1-in-20 taper with the outside tread chamfered similar to the cast iron wheel tread contour.

Encouraging reports have been current with respect to these observations and your committee is endeavoring to secure direct information regarding this contour influence. It is the hope during the coming year to collect more substantial data along this line for presentation in its 1942 report.

Wrought-Steel Wheels for Axles with Enlarged Wheel Seats

The committee's 1940 report included two Tables, A-1 and A-2, as recommended by the Technical Board of the Wrought Steel Wheel Industry, giving the general dimensions of wrought steel wheels for use on A. A. R. axles with enlarged wheel seats.

The committee on Locomotive Construction has made certain revisions in Table A-2 covering wheels for Diesel-electric locomotives and are presenting it for adoption as standard practice in their report for 1941. Your committee concurs in this recommendation.

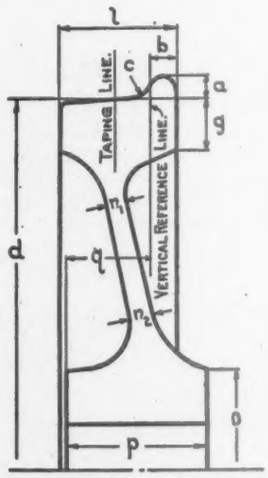
In the case of Table A-1 showing multiple-wear wrought-steel wheels for freight cars, passenger cars and locomotive tenders, the point has been raised that the table as presented in last year's report does not take care of wheels with rims thicker than the nominal 2½ in. as shown. For this reason Table A-1 has been revised to take care of this factor. It has also been amplified to include all tolerances.

Machining One-Wear Wrought-Steel Wheels

There is an opportunity to restore for further service one-wear wrought-steel wheels removed for slid flat, built-up tread, out-of-roundness or similar conditions by either grinding or machining.

On one-wear wrought-steel wheels, especially those manufactured since 1935, with increased flange thickness, when removed on account of worn condition of the flange may be restored to further service with a minimum loss of service metal if the wheels are machined to the multiple-wear contour instead of attempting to maintain the one-wear wrought-steel wheel con-

MULTIPLE WEAR WROUGHT STEEL WHEELS



* MIN. HUB WALL $1\frac{1}{4}$".

** MIN. HUB WALL $1\frac{1}{2}$".

*** STANDARD WHEELS HAVE DIAMETERS AS SHOWN IN THE TABLE WITH RIMS $2\frac{1}{2}$" THICK.

IF RIM 3" THICK IS USED THE METAL IS ADDED ON THE OUTSIDE MAKING THE ACTUAL MINIMUM DIAMETERS 34,37,39,41,43".

DIMENSIONS WITH TOLERANCES.

AXLE CLASS	$4\frac{1}{2}$"×8" 5"×9" $5\frac{1}{2}$"×10"	6"×11" $6\frac{1}{2}$"×12"	$4\frac{1}{2}$"×8" 5"×9" $5\frac{1}{2}$"×10"	6"×11" $6\frac{1}{2}$"×12"	7"×13" $7\frac{1}{2}$"×14"	6"×11" $6\frac{1}{2}$"×12"	7"×13" $7\frac{1}{2}$"×14"	6"×11" $6\frac{1}{2}$"×12"	7"×13" $7\frac{1}{2}$"×14"	6"×11" $6\frac{1}{2}$"×12"	7"×13" $7\frac{1}{2}$"×14"
WHEEL CLASS	33 G	33 H	36 C	36 D	36 E	38 A	38 B	40 A	40 B	42 A	42 B
a	1" $^{+\frac{1}{16}"}_{-0"}$	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME
b	$1\frac{5}{32}$" $^{+\frac{1}{16}"}_{-0"}$	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME
c	$\frac{11}{16}$" $^{+\frac{1}{16}"}_{-\frac{1}{16}"}$	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME
*** d	33" +14 TAPES -0	33" +14 TAPES -0	36" +14 TAPES -0	36" +14 TAPE -0	36" +14 TAPES -0	38" +14 TAPES -0	38" +14 TAPES -0	40" +14 TAPES -0	40" +14 TAPES -0	42" +14 TAPES -0	42" +14 TAPES -0
*** g	$2\frac{1}{2}$" MIN. 3" MIN.	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME
l	$5\frac{1}{2}$" $^{+\frac{1}{8}"}_{-\frac{1}{8}"}$	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME	SAME
n_1	$\frac{3}{4}$" MIN.	$\frac{3}{4}$" MIN.	$\frac{3}{4}$" MIN.	$\frac{3}{4}$" MIN.	$\frac{3}{4}$" MIN.	$\frac{7}{8}$" MIN.	$\frac{7}{8}$" MIN.	$\frac{7}{8}$" MIN.	$\frac{7}{8}$" MIN.	1" MIN.	1" MIN.
n_2	1" MIN.	1" MIN.	1" MIN.	1" MIN.	1" MIN.	$1\frac{1}{8}$" MIN.	$1\frac{1}{8}$" MIN.	$1\frac{1}{8}$" MIN.	$1\frac{1}{8}$" MIN.	$1\frac{1}{4}$" MIN.	$1\frac{1}{4}$" MIN.
o	* 11"	* 12"	* 11"	* 12"	** $13\frac{1}{2}$"	* 12"	** $13\frac{1}{2}$"	* 12"	** $13\frac{1}{2}$"	* 12"	** $13\frac{1}{2}$"
p	7" $^{+\frac{1}{8}"}_{-\frac{1}{8}"}$	$7\frac{1}{2}$" $^{+\frac{1}{8}"}_{-\frac{1}{8}"}$	7" $^{+\frac{1}{8}"}_{-\frac{1}{8}"}$	$7\frac{1}{2}$" $^{+\frac{1}{8}"}_{-\frac{1}{8}"}$	SAME	SAME	SAME	SAME	SAME	SAME	SAME
q	$3\frac{13}{32}$" $^{+0"}_{-\frac{1}{8}"}$	$3\frac{5}{32}$" $^{+0"}_{-\frac{1}{8}"}$	$3\frac{13}{32}$" $^{+0"}_{-\frac{1}{8}"}$	$3\frac{5}{32}$" $^{+0"}_{-\frac{1}{8}"}$	SAME	SAME	SAME	SAME	SAME	SAME	SAME

Dimensions and tolerances of multiple wear wrought steel wheels

tour. Wheels so machined are suitable for service without further disturbance if the spacing back to back of rim is not less than the prescribed limit of 53 in.

Your committee has a sub-committee studying this proposition jointly with a sub-committee of the Arbitration Committee, which joint committee is taking into consideration the physical limits and interchange accounting. The joint committee is not in a position at the time of the preparation of the report to make recommendations, but this subject will be continued on docket with the purpose of having this proposition satisfactorily worked out for inclusion in the 1942 report.

The possibility of using existing wheels for mounting on the new design axle with enlarged wheel seat is still being studied and while there is not sufficient information to make definite recommendations at this time, the results so far indicate that this procedure is going to be possible within reasonable limits.

Matching Wrought-Steel Wheels to Within Variation of one Inch in Diameter in the Same Truck

Upon a request from the Car Construction Committee to revise Par. 162 in the Wheel and Axle Manual, recommending that the difference in the tread diameter between two pairs of wheels in any one truck should not exceed one inch, the Wheel Committee recommends that Par. 162 of the Wheel and Axle Manual be revised as follows: *Proposed.*—All wheels in one truck should be as nearly equal in tape size as the stock on hand permits. *In no case should the difference in tread diameters between different pairs of wheels in one truck exceed one inch except where other means are provided for leveling the truck.*

Revision of Par. 124—Spacing of Rails on Storage Tracks

A member road has recommended that consideration be given to the revision of Paragraph 124—Page 145 of the Wheel and Axle Manual with relation to the spacing of rails on storage tracks and the grouping of wheels of widely varying diameters in order that the flange of one-wear wheel might not nick the axle of an adjacent wheel.

In conformity with this request, the Committee recommends that Paragraph 124 of the Wheel and Axle Manual be revised as follows: *Proposed.*—Storage tracks should be spaced so that the flanges of one pair of wheels cannot strike either the journal or the center portion of the adjacent axle. A nick in the journal may cause a hot box and a nick in the center portion of the axle may lead to breakage. Spacing pairs of rails 6 in. on centers will prevent this nicking as the flanges will then strike the black collar behind the wheel seat of the next axle.

To prevent axles and flanges contacting on wheels of different nominal diameters or on multiple-wear wheels when placed on storage tracks, such wheels should also be segregated so that those having widely varying diameters are not stored together. For example, 33-in. nominal diameter wheels should not be stored with 36-in. diameter wheels. Multiple-wear wheels of the same nominal diameter should be further segregated so that those having rim thicknesses 1¾ in. or more, are stored separately from those having rim thicknesses less than 1¾ in.

Revision of Paragraph 35—Thermal Cracks

Your committee is of the opinion that possibly, serviceable wheels are being discarded on account of developing thermal

cracks. It is recognized that the service condition to which wheels are subjected, where thermal cracks are developed, must govern the procedure to be followed in the handling of such wheels and the Committee does not undertake to recommend a procedure that might cover all conditions where thermal cracks occur.

The committee believes, that generally speaking, wheels developing minor thermal cracks can be reused by turning out such cracks and in this connection it is recommended that recognition be given to this procedure by adding Par. (d) to Par. 35 of the Wheel and Axle Manual to read as follows:

Thermal cracks can be removed by machining and when completely removed the wheels can be again used. When setting up the wheels in the lathe, it is good practice to mark the longest thermal crack with a piece of crayon on front and back face of rim at location of this crack, then proceed with the rough cut until all evidence of the crack has been removed. Then examine the entire tread to note that positively all cracks have been removed, after which a finish cut shall be taken and the wheel put back in service.

Wheel-Shop Practices

In each year's annual report your committee has taken the opportunity to stress the importance of improvement in wheel-shop practices and in its fall 1940 meeting, definite recommendation was made along this line in the form of a request to the General Committee suggesting that funds be appropriated to provide for qualified A. A. R. inspectors to make an inspection of wheel-shop facilities and practices in both railroad shops and car builders plants to determine whether the plants are following the Association's recommendations for handling wheels as outlined in the Wheel and Axle Manual.

The General Committee in passing upon the subject, referred it back to the Wheel Committee instructing the committee to prepare recommendations as to the wheel shop-practices that should be considered mandatory in preparing wheels to be used in interchange service.

Your committee has given careful consideration to the recommendation of the General Committee and is presenting as Appendix B, recommendations relating to wheel-shop practices that should be submitted to the association for adoption as standard practice, with further recommendation that the Arbitration Committee provide the necessary revision in the rules of interchange to make these standard practices mandatory for wheels prepared for interchange service.

Summary of Recommendations—1941

To Be Considered by Arbitration Committee

1—Provide a symbol for identifying in interchange single plate bracketed type wheels.

2—Revise section (i) of Rule 98 by the addition as recommended in the report.

For Revision in Wheel and Axle Manual to Be Submitted to Letter Ballot

1—Revision of Par. 323 relating to the identification marking for ground cast iron wheels.

2—Revision of Par. 162 relating to matching wheels to within a variation of 1 in. in diameter in the same truck.

3—Revision of Par. 124 relating to the spacing of rails for wheel storage tracks.

4—Revision of Par. 35 relating to thermal cracks in wrought steel wheels. It is recommended that a definite code of rules to govern Wheel Shop Practices as outlined in Appendix B be submitted to letter ballot and adopted as standard and this code of rules be enforced through interchange rule agreement.

5—It is recommended that the notes under wrought steel wheel defect symbols be revised as recommended in the report.

The report was signed by H. W. Coddington (chairman), research and test engineer, N. & W.; D. Wood (vice-chairman), engineer of tests, Sou. Pac.; E. E. Chapman, mechanical assistant, A. T. & S. F.; W. R. Hedeman, engineer of tests, B. & O.; J. Matthes, chief car inspector, Wabash; A. M. Johnsen, engineer of tests, Pullman Company; E. C. Hardy, assistant engineer, N. Y. C.; A. G. Hoppe, assistant mechanical engineer, C. M. St. P. & P.; H. H. Haupt, general superintendent motive power, Central Region, Pennsylvania, and C B. Bryant, engineer of tests, Southern.

Appendix A—Recommended Practices for Grinding Slid-Flat Chilled Car Wheels

The limit of grinding or reduction in circumference is governed by the amount of metal which will remain for wear before the wheel will be condemned by the A. A. R. tread-worn-hollow gage. Grinding should not be carried beyond the point where the remaining wearing metal will be less than one-half that of a new wheel. This limit is equivalent to a final tape size which is 10 tape sizes (see Fig. 1) less than the original tape size of the wheel. The depth of chill in wheels of all original tape sizes is adequate to permit this without impairment of service. The following tables define this limitation:

New circumference		Maximum allowable reduction on circumference—linear no.	Minimum allowable ground circumference—linear no.
Tape size—permanent marking	Linear no.—circumference measurement		
1 (10-15)	155	10	145
2 (20-25)	156	10	146
3 (30-35)	157	10	147
4 (40-45)	158	10	148
5 (50)	159	10	149

Length of flat spot, in.	Reduction in circumference required to remove flat spots, linear no.
2	1
2¼	2
2½	2
2¾	3
3	3
3¼	4
3½	4
3¾	5
4	6
4¼	7
4½	8
4¾	9
5	10

Example: A pair of slid-flat wheels are set out for grinding. The wheels were tape 4 when new (linear No. 158), the worn circumference is 155 and the longest of the two flat spots is 3 in. Removal of a 3-in. flat spot reduces the circumference 3 linear numbers. The worn circumference is 155, which will thus be reduced to 152. The minimum allowable ground circumference of a tape 4 wheel is 148 and as removal of the flat spots will not reduce the circumference below that point, grinding is justified. If this flat spot had been 4½ in. long, the required reduction in circumference would then be 8 linear numbers, bringing the

A.A.R. CAR WHEEL CIRCUMFERENCE GAGE

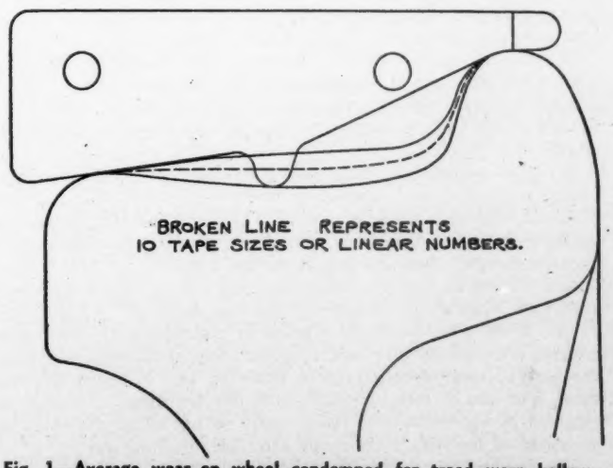


Fig. 1—Average wear on wheel condemned for tread worn hollow—Space between lines 157 and 158 on the upper side of the tape coincides with space representing tape size No. 3 and 3.5 for 33-in. cast-iron wheels

ground circumference to 147, which is below the minimum limit for a tape 4 wheel.

Alternate Method

The A. A. R. tread-worn-hollow gage condemns a wheel for tread wear when practically ⅜ in. is worn off the tread at a point approximately 2½ in. from the crest of the flange. Grinding is justified when the wearable metal below the center of the slid flat spot is 3/16 in. or more. The suitability of the wheel for the grinding operations can be determined by gage measurements and two methods have been suggested for taking this dimension.

The first method is by taking the A. A. R. tread-worn-hollow remount gage and removing 1/16 in. from the projection.

The second method is by taking the same A. A. R. remount gage and without altering the length of the projection, and making it adaptable for this determination by applying a ⅛-in. liner to the surface that contacts the crest of the flange. This liner can be held in place by spring clips.

The first method is illustrated in Fig. 2, upper sketch, and the second in Fig. 2, lower sketch. With either type of gage the application is made at the deepest part of the slid-flat spot and grinding is justified when the point of the gage contacts the wheel tread in the lowest point.

Ready Reference Table for Determining Whether Grinding is Permissible

Linear circumference of worn wheel	Original tape size of wheel -1- 10-15	-2- 20-25	-3- 30-35	-4- 40-45	-5- 50
	Max. length of flat spot permissible to grind, in.				
159	...	...	...	...	5
158	...	...	...	5	4¾
157	...	...	5	4¾	4½
156	...	5	4¾	4½	4¼
155	5	4¾	4½	4¼	4
154	4¾	4½	4¼	3¾	3½
153	4½	4¼	4	3½	3¼
152	4¼	3¾	3½	3¼	2¾
151	4	3½	3¼	2¾	2½
150	3½	3¼	2¾	2¼	...
149	3¼	2¾	2½	...	...
148	2¾	2¼	...	...	...
147	2½	...	...	...	...

Note: Adjoining flat spots less than 2½ in. are judged on the basis of the longer one.

Appendix B— Rules Governing Wheel-Shop Practice

Boring Mill Practice

(a) Boring mills must be maintained with the table running true and with the boring bar held true with respect to the center and plane of the table and without chatter.

(b) Chuck jaws must be properly aligned radially, together with vertical alignment, and contour may have a taper of 1 in 20, to correspond to the wheel tread line, or be maintained vertical.

(c) The bearing points of the chuck jaws must be maintained in one plane at right angles to the axis of the boring bar and truly concentric with it.

(d) Boring mills must be inspected and checked once each week when they are in constant use, and any time that any irregularity is discovered in turning or mounting wheels, and proper repairs made, when necessary, to insure accurate boring of wheels.

(e) The boring bar must have a positive micrometer adjustment for the cutters, accurate to 0.001 in.

(f) If separate roughing and finishing cutters are carried on the boring bar at the same time, they must be separated by a distance greater than the length of the hub.

(g) Boring-bar cutters shown in Figs. 102-A, B and C, Wheel and Axle Manual, or equivalent, must be used.

(h) With wheel properly aligned in position on the mill with regards to concentricity and to plane, the metal removed from the bore of new wheels must be made by two or more separate cuts; i. e., one or more roughing and one finishing. A radius or chamfer of approximately ⅛ in. must be turned at the entry or back end of the hub, to be made after the finishing cut.

The finished wheel bore must be within the limits for rotundity and taper and must be smooth and concentric with the tread.

(i) Inside and outside micrometer calipers are necessary for measurement of wheel bores and axle wheel seats to insure consistent results. Each wheel bore and axle wheel must be checked at not less than three points in its length and on two different diameters at each of these points to insure rotundity and absence of taper. The variation for any two of these measurements shall not exceed 0.002 in.

The bore should be smaller than the wheel-seat diameter, with a tolerance of 0.001 in. per inch of diameter of wheel seat for wrought-steel wheels. For cast-iron wheels the tolerance should be equivalent to 0.0015 in. per inch of wheel seat diameter, and a maximum of 0.012 in. smaller bore than the wheel seat diameter.

Care must be taken to secure the greatest value from the metal in both wheel seat and hub bore (see Fig. 105, Economical Selection of Wheels and Axles, Wheel and Axle Manual).

Axle-Lathe Practice

(a) Axle lathes must be maintained so that the lathe centers are in alignment, wear between the ways and tool carriages must be taken up, so that machining of axles may be done truly concentric and without taper or chatter. Spindle bearings, etc., must be renewed when necessary, to insure accurate turning.

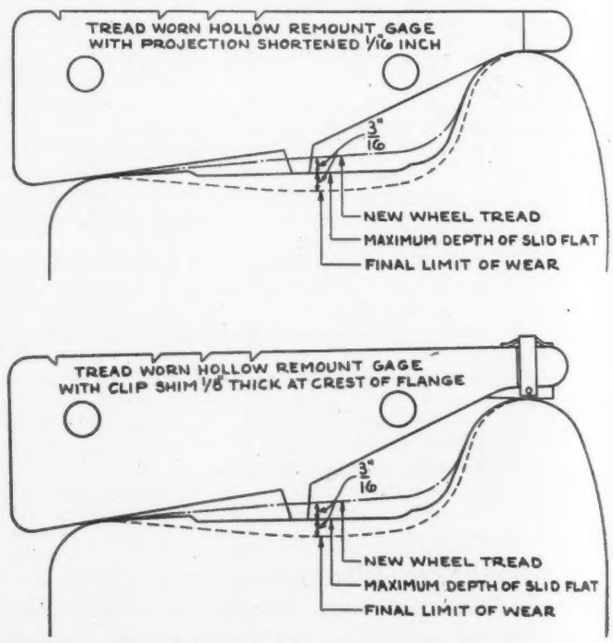


Fig. 2—Gages for checking slid-flat cast-iron wheels for grinding

Lathe centers must be reground or renewed when they show signs of wear.

Axle lathes must be inspected and checked once each week when they are in constant use, and at any time that any irregularity is discovered in mounting wheels, and proper repairs made when necessary.

(b) Lathe tools used for roughing and finishing cuts on collars, journals and wheel seats should have an edge approximately 1¼ in. wide and absolutely straight except for a ⅛ in. radius on one side for cutting the end collar fillet and suitable radius at the other side for cutting the back or dust guard fillet. Sufficient undercurrent clearance should be provided. Separate tools must be used for the roughing and finishing cuts.

See Fig. 110, Wheel and Axle Manual, for proper method of turning journals.

Sharp-nosed tools and coarse horizontal feeds must not be used to finish wheel-seat surfaces.

Wheel seats must not be polished, rolled or filed. A smooth machine cut gives the best results.

(c) New axles and limits of wear dimensions as shown in Fig. 108, Wheel and Axle Manual, must be followed.

(d) Outside micrometer calipers must be used for measuring axle wheel seats.

(e) A taper of 1/32 in. diameter extending a maximum of ½ in.

inward from the dust-guard seat should be turned in the wheel seat to insure true entry into the wheel and to prevent tearing and gouging during mounting.

(f) Centering holes in the ends of axles should have an angle preferably of 60 deg., and an outside diameter of from 1⅛ in. to 1⅜ in., and must have a clearance hole ⅜ in. diameter, 7/16 in. to 9/16 in. deep (see Fig. 109, Wheel and Axle Manual).

Center holes must be wiped clean before placing the axle in the lathe to insure concentricity when turning.

(g) Depressions, continuous streaks or injuries to surface of metal of wheel seat or journals must be removed by a machine cut in a lathe.

Files must not be used on journal surfaces or fillets, but may be used to break the sharp edges of the end collars and dust-guard seat edges.

Journals must never be ground with a coarse abrasive, but may be smoothed with 00 abrasive cloth under light pressure, as prescribed by Wheel and Axle Manual.

(h) Rolling journals to a finish should be done with a hardened-steel roller, having a face 1¼ in. wide and edges turned to radius of ⅛ in. for collar end and radius at other end to suit journal fillet. The roller should be mounted by means of a hardened pin and bushing or by roller or ball bearings in a shank to fit tool-post.

(i) When journals are rolled they must be coated with suitable oil. The following mixtures have proved satisfactory: A mixture of one or two parts of lard oil and one part of paraffin oil, or one part of lard oil and three parts of red machine oil. Before rolling, journal surface must be clean and free from metal chips.

(j) Wheel seats and dust-guard seats must be finished smooth. Journal and journal fillets must be machined smooth before rolling.

(k) Axle wheel seats shall be checked at not less than three points in its length and on two different diameters at each of these points to insure rotundity and absence of taper. The variation for any two of these measurements must not exceed .002 in. Where taper exists within their limit in both axle and wheel bore the tapers must be parallel.

(l) For economical selection of wheels and axles see Fig. 105, Wheel and Axle Manual.

(m) All dismounted axles must be checked in lathe or between centers for rotundity, concentricity and absence of taper of wheel seats and journals before use.

(n) Wheel seats of second-hand axles must be re-turned prior to remounting where there is any evidence of injury to surface.

(o) If journal surface has pronounced coloring due to overheating, or if circumferential checks or cracks are found, or if cracks are found in wheel seats, axle must be scrapped, unless such checks or cracks can be turned out without going below the condemning limits, and the axle Magnafluxed, before being put back into service. (Also see Par. 221 (a), Wheel and Axle Manual, for axle defects and Rules 84, 85 and 86.)

Wheel-Press Practice

(a) Separate presses should be used for mounting and dismounting wheels, where possible, in order to increase production and to save the press used for mounting. If the same press is used for both operations, it should have a capacity of 400 to 600 tons.

Wheel presses must be inspected and checked periodically and maintained so as to give efficient service.

(b) Wheel mounting presses must be provided with a dial pressure gage and a pressure recording gage. These gages must agree with each other and the dial gage must be checked at least every six months by means of dead-weight tester or with an accurate master gage.

(c) The gages must always be used for every mounting operation. The recording gage must make a wheel-fit pressure diagram of the type shown in Fig. 116, Wheel and Axle Manual. The diagram for the mounting of each wheel shall be marked to show the type of wheel, make, identifying number and axle size. The records must be available to A. A. R. inspectors.

During mounting, pressure gage must be watched and, if pressure is outside the limits given in Table, Fig. 115, Wheel and Axle Manual, diagrams showing such misfits must be plainly marked.

(d) In mounting the wheels, both journals must be protected with metal guards during the entire mounting operation to prevent nicking or scratching the journal surface.

(e) Before placing wheels on axle, wheel seats and bore of wheels must be carefully cleaned, then coated with a mixture of basic carbonate white lead and boiled linseed oil, in proportion of 12 lb. of white lead to one gallon of boiled linseed oil, thoroughly mixed. A fresh supply should be mixed every few days.

(f) Wheels must be mounted centrally with respect to the center of the axle, with use of suitable axle centering gage, and mounting gages as shown in Figs. 118 and 119, and paragraphs 247, 248 and 249 of Wheel and Axle Manual.

(g) Wheel mounting and check gages, as well as centering gages, must be checked frequently by shop foreman or test department so that excessive wear will not allow improper mounting of wheels.

(h) New wheels mounted on the same axle must be the same tape size, and bear the same tape-size marking. (See Rule 69.)

Second-hand wheels should be as nearly the same diameter as possible, and must not vary more than ½ tape size, when measured with a standard wheel tape. (See Rule 69.)

(i) It is forbidden to heat the hub of a tight wheel with a torch to assist in dislodging it. Wheels bearing any evidence of such heating, or which have holes burned in the plate by a torch, must be scrapped.

(j) In handling pairs of mounted wheels, wheel sticks must not be used on journal surface.

(k) Journals of mounted axles must be properly coated with rust preventative unless they are going to be placed directly into trucks. Before placing wheels with coated journals in a truck, the coating must be carefully removed with a suitable solvent.

Car-Wheel Lathe Practice

(a) Car-wheel lathes must be maintained so that accurate turning of wheels is assured.

Periodical inspection and check must be made and necessary repairs given when required.

(b) Tools to be used for the complete operation of restoring the tread and flange contour of steel wheels are, a round-nosed roughing tool or round-button tool, which is used to cut the top off the flange and to rough off the tread to within 3/32 in. of the finished tread surface as shown by the scalloped dotted line in Fig. 121, Wheel and Axle Manual, and three finishing tools. These last three tools are forming blades and must not be forced to a degree which will tear the surface of the metal. Turret type or sliding tool-post to hold all the tools should be used so that changing of tools during the operation is not necessary.

(c) Before a pair of wheels is placed in the lathe, each wheel should be taped and gaged at the point where the flange and rim are thinnest with the A. A. R. steel wheel gage at at least three points around the circumference to determine the amount to be turned off to restore the contour.

(d) The A. A. R. steel wheel gage must be used, as referred to in paragraphs 276 to 280, inclusive, Wheel and Axle Manual.

(e) Both wheels of a pair must be turned to the same diameter, and wheel treads and flanges must be concentric with the journal surfaces, and in a plane at right angles to the axis of the axle.

(f) Steel wheels should be re-mated to save service metal when the cost justifies the change of one wheel (see paragraphs 290-291, Wheel and Axle Manual).

Wheel Grinding Practice

(a) Car-wheel grinders must be maintained so that they grind the treads the entire circumference of the wheel truly concentric with the journals.

(b) Cast-iron one-wear wrought- and one-wear cast-steel wheels should not be ground unless they will meet the requirements of the A. A. R. limit gages shown in Fig. 7 and Fig. 8-A (Interchange Rules) for remounting as to flange height, flange thickness, vertical flange and tread worn hollow.

(c) Slid-flat cast-iron wheels should not be ground if they are considerably treadworn, badly brake burned or skid burned, or if they are comby, or if the slid-flat spot is so long that grinding it out might go through the chill.

(d) Water should run continuously on the treads just above the contact with the grinding wheel. During grinding, the tread must not be hot enough to burn the hand.

(e) A bar swung from a rigid frame for accurate calipering should be used frequently to insure that finished wheels will be of the same diameter, and shall be finally checked with a wheel tape before removal from grinder.

(f) Ground wheels must have the date and shop symbol and letter G stamped on them.

A. A. R. Standard Gages

(a) The various gages used in connection with wheel and axle work are listed in Section XX, Wheel and Axle Manual.

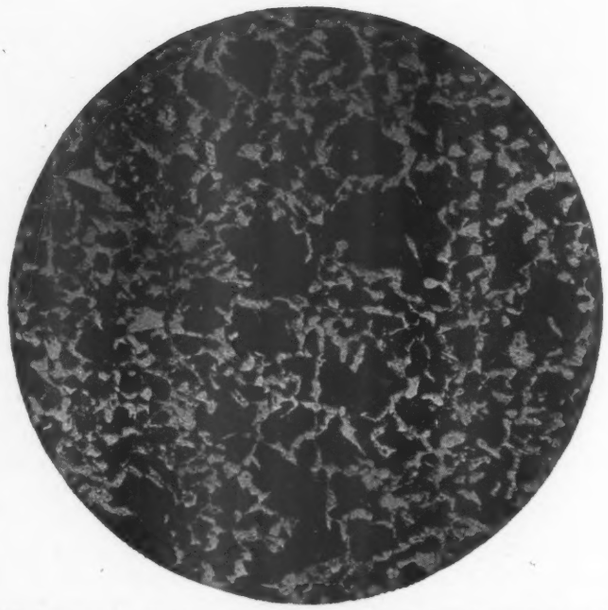
(b) These gages must be inspected periodically and checked with master gages by a competent person. When found worn to the limits, they must be repaired or replaced.

Discussion

At the request of the presiding officer, F. H. Hardin, president, Association of Manufacturers of Chilled Car Wheels, referred to the cored-hub wheel, commenting on the possibility of saving some metal when metal is scarce. He said that this type of wheel saves about 25 lb. of useless metal which retards cooling; the new construction gives a better mechanical job; the wheels can be shaken out of the mold more quickly, and stresses are better distributed. He said that the association appreciates an opportunity of working with the committee in effecting improvements in chilled-iron wheels. Mr. Hardin referred to the shortage of scrap wheels for melting stock and said that the only other substitute, pig-iron, is not entirely desirable, besides being somewhat difficult to secure at the present time. In addition to ordinary wheel replacement, the great amount of new car equipment in prospect is creating a heavy demand for chilled iron wheels and it is important, from the point of view of the railroads and wheel manufacturers alike, to return as many scrap chilled-iron wheels as possible for remelting and making into new wheels.

Supplementing his previous comments, C. T. Ripley, chief engineer, Technical Board, Wrought Steel Wheel Industry, referred to shop practice. He explained that the use of modern gages and close tolerances is very necessary but raised the question how railway wheel-shop forces are to do this kind of work with the old and worn-out machine equipment still so generally found in many shops. Mr. Ripley paid tribute to the class of men who now work in railway wheel shops but are handicapped by antiquated machinery often in poor mechanical condition. He appreciated the difficulty of getting new replacement machinery for railway wheel shops at the present time, but indicated that much can be done to place present equipment in better operating condition. He suggested that wheel shop supervisors themselves be required to produce the same accuracy of fits and close tolerances which they are asking their machine operators to obtain from these worn machines.

The report was accepted and submitted to letter ballot.



Maximum grain structure acceptable in grade B annealed carbon steel forgings

Specifications for Materials

The committee submits the following revisions to certain existing material specifications for consideration: Specifications M-101-39, axles, carbon steel, for cars and locomotive tenders (Exhibit A) and Specifications M-102-40, forgings, carbon steel, annealed and unannealed (new Par. 13 to be added and subsequent paragraphs being renumbered). New Par. 13 is as follows:

13.—Microscopic Tests.—(a) One microscopic test shall be made from each annealing charge. If more than one melt is represented in a charge, one microscopic test shall be made from each melt. The sections for microscopic test shall be cut from the large undistorted portion of the tension test specimen in such a way as will give one face normal and one face parallel to the axis of the specimen.

(b) Both faces shall be polished practically free from scratches. The transverse face shall be etched with four per cent solution of nitric acid in alcohol. The longitudinal face to be left unetched. The specimen shall be examined under a magnification of 100 diameters.

(c) The whole of the transverse section shall show uniform, well broken up, fine grained structure, and shall conform to the requirements illustrated in photomicrographs (Exhibit B). Only one irregular mesh as large as ½ in. in diameter shall be permitted in a field 3 in. in diameter, as shown on the screen or photomicrograph.

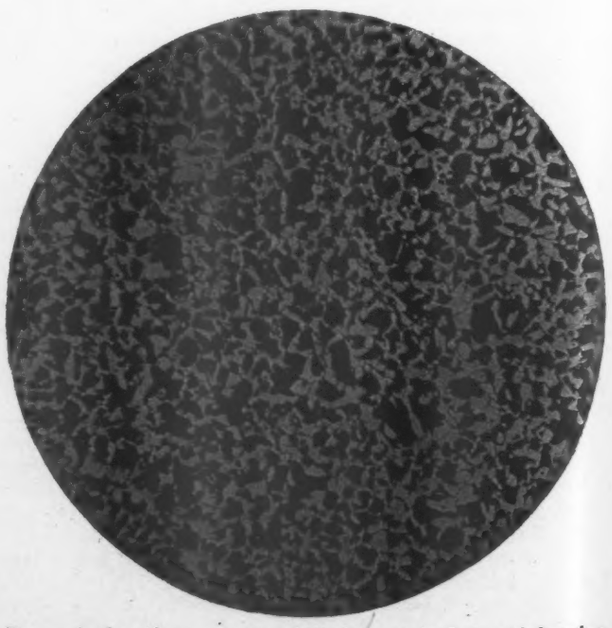
(d) For information only, the longitudinal unetched face will be examined for solid non-metallic impurities and should show such impurities well scattered over the field.

Specifications M-105-34, blooms, billets and slabs for forgings. Recommended changes to be made are as follows: New Par. 11 (present Par. 11 and subsequent paragraphs renumbered) to be added to this specification, to read as follows:

"11.—Cutting.—Cutting or parting of material shall not be done by flame cutting except by methods approved by the purchaser involving preheating and temperature control when necessary to avoid any damage to flame-cut surface.

Specifications M-302-40, refined wrought iron bars. Changes to be made as follows: Page 3, Sec. 9 (b):

"(b) Bend Test Specimens.—Round, square and hexagonal bars not over 1½ in. in diameter or thickness, and flat bars not



Fine grained uniform structure desired in grade B annealed carbon steel forgings

over 1½ in. in width or 1 in. in thickness shall be bent in full section as rolled. For larger round, square, and hexagonal bars, the bend specimen may be machined to 1½ in. diameter. For flat bars wider than 1½ in. but less than 1 in. thick, the bend specimen may be machined to 1½ in. in width. For flat bars 1 in. or thicker, the bend specimen may be machined to 1 in. square. The edges of the machined specimens shall be rounded to a radius of 1/16 in."

Specifications M-603-38, Hose—Air, Gas and Oxygen, Wrapped and Braided. In compliance with request that a ½-in. size hose for gas and oxygen be included in these specifications, the specification has been revised accordingly, and recommended revision is given in Exhibit C.

Specifications M-607-38, rubber goods, general instructions on standard methods of tests for. Recommended revision of this specification is given in Exhibit D. In addition to some editorial changes, the revision consists of the following: (a) Methods of measuring lengths, diameters and thickness of hose and component parts thereof. (b) Specified A. S. T. M. Die B, ¼ by 2 in., replacing the die now used, of ½ in. (c) Specifying the use of micrometer exerting a force of 3 oz. rather than 9 oz. [Exhibits A, B, C, D are not included in the present abstract of the committee's report.—EDITOR.]

All of the material specifications have been studied in detail during the past year, and while some changes have been agreed upon, in view of manufacturing conditions and the market situation, it is felt inadvisable to recommend changes to be made this year, other than included in the above.

The various members of the Committee on Specifications for Materials have cooperated with other committees in connection with various investigations and specifications drafted by the other committees, handled by them and incorporated in the annual reports of such other committees.

The report was signed by T. D. Sedwick (chairman), engineer of tests, C. R. I. & P.; F. Zeleny, engineer of tests, C. B. & Q.; H. G. Burnham, engineer of tests, N. P.; H. P. Hass, engineer of tests, N. Y. N. H. & H.; J. R. Jackson, engineer of tests, M. P.; H. G. Miller, engineer of tests, C. M. St. P. & P.; L. B. Jones, engineer of tests, Penna.; C. B. Bryant, engineer of tests, Sou.; W. R. Hedeman, engineer of tests, B. & O.; W. F. Collins, engineer of tests, N. Y. C.; and W. Bohnstengel, engineer of tests, A. T. & S. F.

The report was accepted and the recommendations submitted to letter ballot.

Report on Car Construction

Designs of Standard Cars

LIGHTWEIGHT STEEL-SHEATHED BOX-CAR DESIGNS

Last year a program was outlined for the development of lightweight box-car designs in cooperation with the Freight Car Design Committee of the American Railway Car Institute. Tentative designs for four types of construction referred to were submitted for study and analysis. The committee did not submit recommended light weight box car designs at this time. It is proposed to progress this matter with the A. R. C. I. as conditions permit.

LIGHTWEIGHT HOPPER CARS

The situation with respect to the development of designs for lightweight hopper cars of 50 tons and 70 tons nominal capacity, in cooperation with the A. R. C. I., is the same as for the lightweight box-car designs. No change has been made in the development program as outlined under Welded Hopper Cars in the annual report for 1940.

50 FT. 6 IN. STEEL-SHEATHED BOX AND AUTOMOBILE BOX CARS

Arrangements were made during the last regular meeting of the committee, held in March of this year, for the preparation, in cooperation with the A. R. C. I., of designs for steel-sheathed box and automobile box cars of carbon-steel riveted construction having the following clear inside dimensions:

Length between end linings	50 ft. 6 in.
Width between side linings	9 ft. 2 in.
Height at eaves	10 ft. 6 in.

Provision will be made in the base design of the box car for single side doors of clear opening width to meet traffic requirements as will be developed through the Traffic and Operating-Transportation Divisions. In the base design of the automobile box car double side doors having staggered openings 15 feet clear width will be incorporated.

For both the box- and automobile box-car designs, alternate applications of double end doors in one end of the car will be developed.

Overall dimensions for both types of cars will be made to come within the maximum operating clearance outline, Exhibit N dated March 28, 1940, as tentatively agreed upon and now the subject of a separate investigation being made by the Engineering Division. (This was shown as Fig. 1 in the report.)

Cars Ordered From May 1, 1940 to May 1, 1941

Included in the report was a detailed tabulation of 55,505 house type and hopper cars ordered during the above period. An analysis of the figures indicates that the roads have followed A. A. R. design recommendations to the extent shown in the following summary:

Design	No. of cars	Per cent of total
A. A. R. throughout or conforming thereto including lightweight alloy steel to A. A. R. base dimensions, floating center sills, and inside dimensions to meet specific conditions	49,870	89.85
A. A. R. except 26¾ in. center-plate height	2,000	3.60
Not A. A. R. except center sills and 25¾ in. truck height	550	.99
Not A. A. R. design except 25¾ in. truck height	3,000	5.41
Not A. A. R. design	85	.15
Total	55,505	100.00

Another tabulation showed that of the total of 85,794 cars listed 73,825 or 86.05 per cent have standard 25¾-in. center-plate height, 11,110 or 12.95 per cent have 26¾-in. center-plate height, 360 or .42 per cent have 26-in. center-plate height, 300 or .34 per cent have 26⅛-in. center-plate height, 190 or .22 per cent have 27⅝-in. center-plate height, 5 or .01 per cent have 23¼-in. center-plate height, 2 or .005 per cent have 24¾-in. center-plate height, and 2 or .005 per cent have 27-in. center-plate height.

Standard Steel-Sheathed Box Cars

Since the introduction of the A. A. R. standard box car of larger dimensions as covered by the drawings included in the 1937 report of the Committee on Car Construction, there has been little demand for the drawings covering the 8 ft. 9⅛ in. wide, 9 ft. 4 in. high box car.

In accordance with action at March meeting of Committee on Car Construction, the following drawings now in the Supplement to the Manual will be removed: 500-B; 501-B; 502-B; 503-B; 504-B; 505-B; 506-A; 507-A; 512-B; 513-A; 514-A; 515-A; 516-C; 517-B, and 524-A. The original tracings of these plates will be available in the office of the secretary in case any railroad requires copies of same.

Drawings in the 1500 group covering the larger car are being revised to show reinforced floor structure, improved corner post construction and roof application as referred to in the 1940 report of the car construction committee and subsequently approved by letter ballot.

Due to insufficient time it has not been possible to revise the general drawings now in the Supplement to the Manual for inclusion and issuance as a part of the annual report for this year. It is anticipated, however, that these revisions will be completed by the date of the annual meeting. In the meantime, any road which contemplates building cars of this construction can obtain information from the secretary's office as to the revisions which are being made.

Standard Hopper Cars

As a result of additional experience in the construction and operation of A. A. R. standard 50- and 70-ton self-clearing hopper cars, certain further changes have been made in details of design such as sill steps, body center plate, bolster center fillers, and cubic capacity. The drawings have been revised to cover the various features referred to.

Cubic Capacity

Calculations have been made for the 50- and 70- ton A. A. R. hopper cars, and the following information has been shown on general arrangement drawings 600-D and 601-D:

	50-ton hopper	70-ton hopper
Cubic capacity (level full).....	2,145 cu. ft.	2,773 cu. ft.

Body Center Plate (70-ton Hopper)

To avoid interference with truck center plate rim, it is necessary to countersink the heads of the four inside rivets (4⅜16 in. each side of center line of car) on under side of body center plate and the following drawings have been revised to show:

Bolster Center Fillers

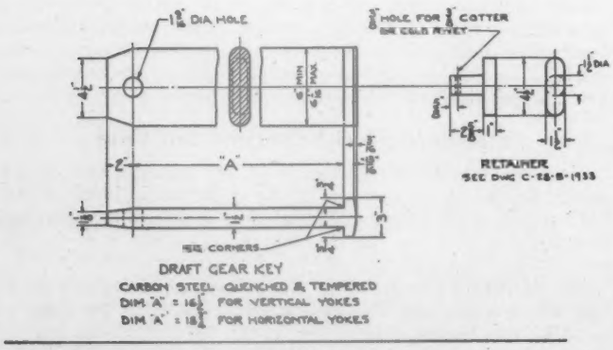
To show correct rivet spacing for both 50- and 70-ton hopper cars, drawing 611-D and 612-C showing bolster center fillers have had table added showing distance from center line of car to inside rivet holes.

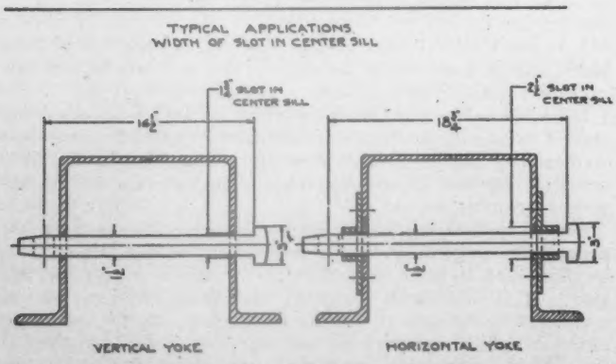
Draft-Gear Key and Retainer Key Slot in Center Sills

Plate 214 in the Supplement to the Manual shows a draft-gear key of one length. Inasmuch as it is the general practice to use keys of different lengths for vertical yoke and horizontal yoke, and the width of the slot in the center sill varies, depending upon which type of attachment is used, a new drawing has been prepared to show a standard draft key and retainer with dimension from underside of head to center of retainer hole and width of slot required in center sills as follows:

	Vertical yoke	Horizontal yoke
Under head to center of retainer hole.....	16½ in.	18¾ in.
Width of slot in center sills	1¾ in.	2½ in.

The depth of the head on the draft key has been increased from 2½ in. to 3 in.





Draft-gear keys and width of center-sill slots for vertical and horizontal yokes

It is recommended that new drawing C-28-D-1941 be submitted to letter ballot, and if approved, that it will be inserted in the Manual, superseding plate 214 now in Supplement to Manual, which will be removed.

Design Dimensions for Separable Pedestal Type Journal Boxes "E", "F" and "G"

In view of the increasing use of larger size axles on heavy freight equipment, as well as locomotive tenders, drawings have been prepared to show design dimensions for pedestal-type journal boxes for use with 6 by 11-in., 6½ by 12-in. and 7 by 14-in. journal axles. These designs are based on boxes of this type furnished by various manufacturers and include recess in top of box for leaf spring band which represents the construction most commonly in use.

It is recommended that these drawings be submitted to letter ballot, and, if approved, arrangements will be made to include them in the next revision of the A. A. R. Manual of Standards and Recommended Practice.

Front and Back Draft Stop

Page 39, Section "C," of the A. A. R. Manual of Standard and Recommended Practice illustrates as standard adopted in 1907, designs of Front and Back Draft Stop.

The introduction and use of the more modern designs of strikers with integral front draft stops and bolster center fillers with integral back draft stops on the A. A. R. standard cars as well as other modern cars, has made the separable draft stops obsolete.

It is recommended that the removal of drawing C-39 from the Manual be submitted to letter ballot.

Record of Revisions in Drawings and Specifications in Supplement to Manual

In connection with action at the Car Construction Committee meeting of March, 1940:

Sheets showing record of all revisions to date for the 500, 600 and 1500 Series Drawings as well as the box-, hopper-, and refrigerator-car specifications have been prepared. These sheets were included as a part of the report.

Originals will be kept currently up-to-date and will be retained in the office of the secretary, where they will be available as a matter of information and record.

Bolster Center Fillers and Strikers

The present designs of cast steel strikers and bolster center fillers have been widely produced and used since 1932.

The many thousands of cars which have been built, embodying these present designs, amply prove how adequately and efficiently these designs of 1932 have served their purpose.

Since 1932 certain refinements and developments have made possible reduction in weights and production costs. During the same period the art of fabrication by welding has been considerably developed, and is now more generally used in car construction.

The Manufacturers' Committee on cast-steel strikers and bolster center fillers submitted to the Car Construction Commitee a report and detail designs covering the following types of strikers and bolster center fillers in Grade B steel: (a) Reduced-weight riveted designs; (b) Reduced-weight designs for manually welding to sills; (c) Reduced-weight designs of bolster center fillers for automatically welding to the sills.

The reduced weight designs of strikers and bolster center fillers are based on static and dynamic tests on test specimens consisting of short lengths of the A. A. R. standard Z-sills having the castings attached by rivets or welds in accordance with the designs tested. These tests indicated that an appreciable saving in weight could be made without sacrificing strength.

The riveted designs have been reviewed by the committee and it is recommended that they be added to the Supplement to the Manual with new numbers. Reference to these new numbers will be made on the general arrangement drawings for the box and hopper cars.

The striker details are the same on both hopper and box cars.

The proposed reduced-weight designs for welding to the sills were approved by the committee, but the details are not recommended to be shown in the Manual; however, details of these

will be available and may be obtained through the office of the Secretary of the A. A. R.

In view of the development of the art of die-pressing bolster center fillers to suitable tolerances instead of machining, it is recommended that die pressed center fillers be made a permissible alternate.

Trucks for High-Speed Freight Service

Since last fall the American Steel Foundries have been conducting tests with existing freight-car trucks to see what can be accomplished to improve these trucks in freight service, but to date nothing has been released that would be of interest.

Standardization of Axles Equipped with Roller Bearings

The A. A. R. Committee on Axle Research has now developed axles for 5½ in. by 10 in. and 6 in. by 11 in. journals, based on the new design of passenger-car axles, that will be suitable for application of Timken, Hyatt, S-K-F, and Fafnir roller bearings. The axle committee is continuing this subject to include axles having 4¼ in. by 8 in., 5 in. by 9 in., and 6½ in. by 12 in. journals. As soon as these designs have been completed it is the intention to prepare a report and issue drawings showing all of the axles that will be suitable for interchangeability of roller bearings manufactured by the four companies referred to.

When these axle designs are completed they will also be satisfactory for tender journals.

Passenger-Car Axles

Recommendation was contained in the 1940 report of the Committee on Car Construction for the adoption of new designs of axles A, B, C, D, E and F for new passenger cars. The details of tests and study leading to this recommendation was included in the Fourth Progress Report of Passenger Car Axle Tests, dated April, 1940, and sent to the members about June 1, 1940. The letter ballot vote to adopt these designs for passenger car axles was nearly unanimous and the designs have been incorporated in the Manual of Standard and Recommended Practice.

It is expected that tests to determine the proper material specifications for passenger car axles for heavy duty service will be completed in a short time and soon thereafter report and recommendations will be submitted to the members.

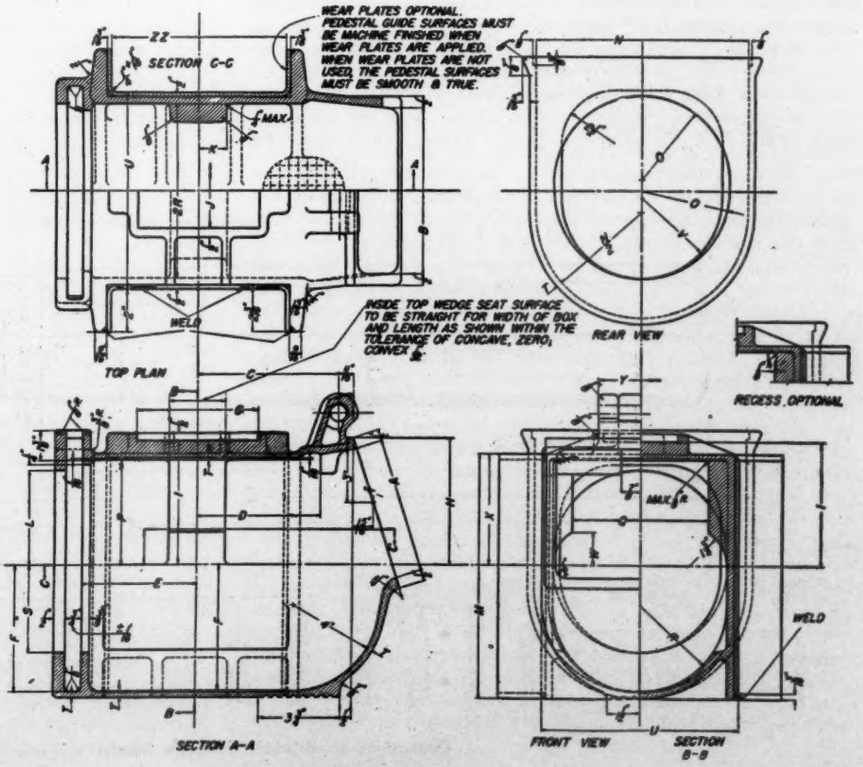
Tubular Car Axle

Under date of October 20, 1939, H. C. Urschel submitted application for approval of a new type of tubular railroad-car axle. This application was considered by the Committee on Axle Research at a meeting held October 16 and 17, 1939, and Mr. Urschel was advised it would be necessary to conduct fatigue tests with full-size specimens of his axles on the A. A. R. fatigue testing machines located at the plant of the Timken Roller Bearing Company, Canton, Ohio, and the results of these tests submitted to the Axle Committee before any approval for such type of axle could be considered. This advice was transmitted to Mr. Urschel under date of December 11, 1939.

The fatigue tests were conducted during the months from January to August, inclusive, 1940. Charles P. Palmer submitted a summary of the tests and requested that this matter be placed before the proper committee of the Association for consideration of this type of axle for use on equipment in interchange. The application was referred to P. W. Kiefer, chairman, Committee on Car Construction, who directed under date of September 16, 1940, that this request should first be submitted to the Axle Committee for review and recommendation as to what it thought should be done or would be necessary. Accordingly, the request was submitted to the Axle Committee at a meeting held in Canton October 16 and 17, 1940, at which time the following action was taken:

After a thorough discussion of the tubular axles of the Pittsburgh Steel Company the committee instructed the secretary to advise the Committee on Car Construction that the tests of this axle so far conducted have only demonstrated the relative comparison of wheel-seat section of the class of heat-treated material used in this design of axle and it was the opinion of the committee that before approval can be given to the general, or even limited application of this type of axle, data should be submitted of possible service performance of this type of journal when either overheated as a whole or locally at various temperatures equal to that of molten brass. It was the further feeling of the committee that this information relative to the journal should be esablished on both journal of nominal and minimum dimensions.

This action was referred to the Committee on Car Construction and was considered by that committee at a meeting held in Chicago on October 24 and 25, 1940. It was the consensus of opinion of the Committee on Car Construction that this matter



Journal box for large size axles

should be left in the hands of Mr. Cantley and the Axle Committee for thorough investigation before it could be considered for interchange service. Among other things this would include the questions referred to in the action taken by the Committee on Axle Reaserch at its meeting of October 16 and 17, 1940, quoted above.

It was also the consensus of opinion of the Committee on Car Construction that efforts such as this should be encouraged as being along the lines of advancing the state of the art both from the standpoint of material and design, and in the interest of better performance, and that Mr. Cantley and his committee should cooperate fully in the development of such further tests as should be made to demonstrate the suitability of this axle for general interchange service.

The Urschel Engineering Company conducted the tests required by the Axle Committee and furnished their findings in two reports. These two reports were considered at a meeting of the Axle Committee held in Chicago on December 19, 1940.

After reviewing all the data on laboratory tests on their tubular axle and also information obtained from tests conducted at Canton, the committee was of the opinion that this type of tubular axle, as made by the process set forth by the Pittsburgh Steel Company, had merit. However, the committee felt that additional laboratory tests should be made on the journal portion of the axles to determine the relative sensitivity to injury due to local overheating of the tubular axle as compared with the solid axle.

The committee also specified that the workmanship of the axle should be entirely smooth, both exterior and interior, and entirely devoid of any tool marks, die marks, or other imperfections that might cause failure of the axle; also that it is very important that the axle be concentric and that care must be exercised to insure such concentricity throughout the axle with uniform wall thickness at the journal, wheel seat, and center portion of the axle.

A meeting of the Axle Committee was held on January 23, 1941, at which time further consideration was given to the additional tests of the tubular axle. After considerable discussion it was decided that additional tests should be made on the journal portion of the axles. To assist the Pittsburgh Steel Company it was agreed that the Chairman, Mr. Sedwick, and Mr. Johnsen should help them to set up a program to determine the relative sensitivity of injury due to local overheating of the tubular axle compared with solid axles. On January 7, 1941, the Chairman, Mr. Sedwick and Mr. Johnsen met with Mr. Urschel and explained to him what they considered should be the method of making these additional tests. They further suggested that he contact the Engineer of Tests of the Pennsylvania Railroad at Altoona to see if their drop test machine could be used for suggested tests. Mr. Urschel visited Altoona and found that the Pennsylvania Railroad had a machine that would be satisfactory for this purpose. In discussing this subject again at the meeting with the A. A. R. representatives at Canton it was agreed by the committee that in making the drop tests the local heating effect should be established according to the method demonstrated by Mr. Urschel wherein the distance from the surface of the axle to the outlet of a No. 12 tip is to be ⅜ in., and heat to be applied 2 in. out from the dust-guard seat of the journal and the time of heating two minutes. The temperature of the surface to be read as a matter of record during the time the torch is applied to the journal with 50 lb. air pressure and 5 lb. gas pressure.

For comparative purposes two axles to Specifications M-101, Design 6, were furnished for test by the A. A. R., the journals to be machined to 5¼ in. diameter and the wheel seats to be machined to 7 9/16 in. diameter. After this machining had been done the axles were shipped to H. C. Urschel, Pittsburgh Steel Company, Allenport, Pennsylvania.

The drop tests were started on February 11 and completed on February 13, 1941. Prior to witnessing the drop tests at Altoona, the committee visited the plants of the Pittsburgh Steel Company at Monessen and Allenport, Pa., where they inspected the methods used in forging the tubular axles. After the drop tests were completed a report was prepared and the results of the tests were considered at a meeting of the Axle Committee held in Chicago on March 6. In addition to discussing the report on drop tests, the two former reports were also reviewed and again thoroughly considered. The Axle Committee finds that the Urschel Engineering Company, which is handling this matter for the Pittsburgh Steel Company, has complied with all requests the Axle Committee made for tests. The cost of all these tests has been assumed by the Urschel Engineering Company and the Pittsburgh Steel Company and consequently there has been no expense to the Association in conducting these tests.

Conclusions

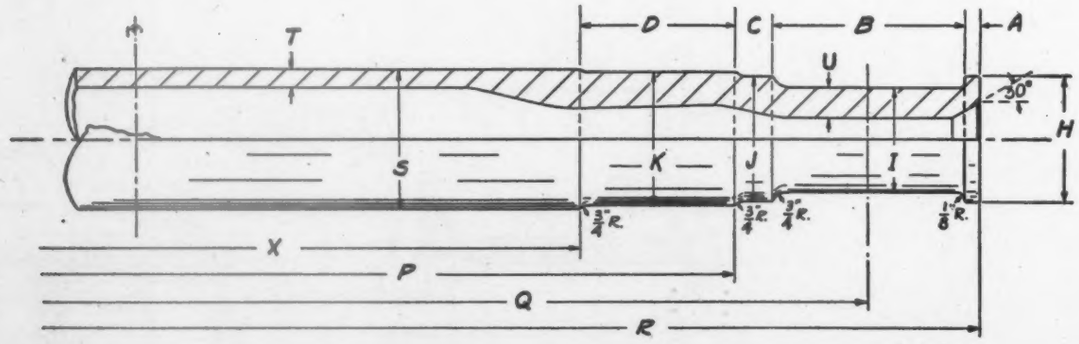
(1) Possible service performance of this type of journal when either overheated as a whole, or locally, at various temperatures equal to that of molten brass. Tests indicated that the heating of the journal of the tubular axle did not affect the functional strength of the axle in any way because the journal portion is much heavier in proportion to the load it must carry than the inside of the wheel seat where the maximum stresses occur.

(2) Deflection of journals—A. A. R. Design No. 6 axle and tubular type axle. In the drop tests the journals of both types of axle were subjected to the same type drop tests; that is, starting at one foot with a 2,000-lb. tup, and increasing the height by increments of 6. in. up to 6 ft.

Permanent set with the center of the axles clamped rigid. The total set of the solid axle was 1.4 in., 1.34 in., and 1.39 in.; of the tubular axle, 0.68 in.

Tests made with axle center free to flex. Solid axle, 0.74 in.; tubular axle, 0.48 in.

Permanent set at the center of the solid axle was 0.34 in. and of the tubular axle 0.03 in.



Class of axle	Size of journal, in.	A in.	B in.	C in.	D in.	H in.	I in.	J in.	K in.	P ft.-in.	Q ft.-in.	R ft.-in.	S in.	T in.	U in.	X ft.-in.
B	4¼ x 8	5½	8	2	8 1/16	5¾	4¼	5¾	5¾	5–3	6–3	7–0¼	6	¾	1 1/16	3–10⅞
C	5 x 9	5⅝	9	2	8 1/16	6⅛	5	6⅜	6½	5–3	6–4	7–2½	6¾	¾	1½	3–10⅞
D	5½ x 10	5⅝	10	2	8 1/16	6⅜	5½	6⅝	7	5–3	6–5	7–4½	7¼	1	1½	3–10⅞
E	6 x 11	5⅝	11	2¼	8½	7¼	6	7¼	7⅝	5–2½	6–6	7–6⅝	7½	1	1	3– 9¼
F	6½ x 12	5⅝	12	2¼	8⅝	7¾	6½	7¾	8⅛	5–2½	6–7	7–8¾	8⅛	1 1/16	1⅝	3– 9¼

Dimensions of Urschel-Pittsburgh tubular car axle

One end of two of the tubular axles broke off, one at a drop of 5 ft. 6 in., and the other at 6 ft., but both of these axles were clamped rigid in the center and it was felt that this was a contributing cause as an inspection of the metal after failure did not indicate any poor structure.

(3) All of the tubular axles tested were designed to maintain the old wheel fit diameter of 7 in. which is the standard nominal diameter for 5½ by 10-in. journals, whereas the solid axles recently redesigned by the Axle Committee require 7 9/16-in. diameter wheel fit. The design of the tubular axle is such that it does not require the same diameter of wheel fit that is required by the redesigned solid axle.

(4) The tubular axles we tested might be considered as handmade axles and did not include all the refinements that could have been obtained if they had been made with proper forging equipment. With the proper forging equipment for manufacturing this type of axle there will be an entirely smooth finish both on the exterior and interior of the axle and uniform sections throughout. The smoothness of the finish will be comparable to the tubing that is now being made by the same forging process the axles are to be made of and upon inspection we found this to be a smoother finish than could be obtained by turning.

(5) While all tests of the tubular axle were conducted with axles having journals of 5½ in. by 10 in. so as to be comparable with the A. A. R. tests of solid axles, a drawing dated March 20, 1941, showing the design of Urschel-Pittsburgh tubular Railway Axles for journals 4¼ by 8 in. up to and including 6½ by 12 in., is included.

Advantages of the Tubular Axle as Compared with the New Design Solid Axle

(1) The tests conducted with the Urschel-Pittsburgh tubular railway axle at Canton indicate that the wheel seat and body construction has more than a 25 per cent increase in fatigue strength compared with the new A. A. R. Design No. 6 axle for 5½ in. by 10 in. journal; and the new A. A. R. Design No. 6 axle has from 60 to 80 per cent greater allowable design fatigue strength than the present 5½ in. by 10 in. journal A. A. R. axle with the "black collar."

(2) Increased loading capacity with increased factor of safety.

(3) Interchangeability with the A. A. R. standard solid axles.

(4) Material decrease in weight. As an example, the 5½ in. by 10 in. journal tubular axle weighs approximately 275 lb. less per axle than the solid axle with the same size journal. The proportionate reduction for tubular axles having journals larger than 5½ in. by 10 in. will be greater.

(5) The committee has no information on the relative costs of the tubular axle as compared with the solid axle, but in making such a comparison it should be with the new design A. A. R. passenger car axles which require that the body of the axle be smooth-machined between wheel seats.

(6) The tubular axles are heat treated by a special heat treating process and it was found from actual tests that by this method of heat treating the wear of the journal between collars increases less rapidly than with the untreated solid axles.

Recommendations

In view of the above investigation by the A. A. R. Committee on Axle Research, the committee recommends that the Urschel-Pittsburgh tubular railway axle be approved for general interchange service. In giving this approval, however, it is to be understood that it is for this make of axle only and should any other manufacturers of axles ask for approval of hollow or tubular axles, such axles will be required to go through the same series of tests that were required of the Urschel-Pittsburgh Tubular Railway Axle.

The above report with conclusions and recommendations was considered by the Committee on Car Construction at a meeting held in Chicago on March 13 and 14, 1941, and after discussing the entire report of the Axle Committee in detail the Committee on Car Construction recommended that the Urschel-Pittsburgh tubular railway axle be submitted to letter ballot to be adopted as an alternate interchange standard for all purposes.

Report on Side Frames and Bolsters

During the past year numerous new designs of side frames and bolsters were submitted for approval. Seventeen new designs of side frames and eight new bolster designs have been approved, while eleven side frame designs and eight bolsters have applications pending.

The report also included a complete tabulation of side frames and bolsters approved to date and a similar tabulation of designs on which applications are pending.

Report of Sub-Committee on Definitions and Designating Letters

Since the last annual report the sub-committee has passed upon the following which have been approved by the members through letter ballot:

Substitute the following for the present definition for *LF* cars:

LF—A flat car equipped with one or more demountable containers for the transportation of liquids or other commodities, not under refrigeration.

Reason—The old definition is in conflict with the new definition for *RC* cars.

Adopt a new designation and definition for *RC* cars as follows:

RC—A car equipped with one or more demountable insulated containers. The containers may be equipped with facilities for refrigeration.

Reason—To provide for a new type of car.

Adopt a new designation and definition for *LFA* cars as follows:

LFA—A flat car equipped with a container or containers for transporting commodities immersed in liquids or gases.

Reason—To provide for a new type of car.

The committee has also passed favorably upon the following and recommended that it be submitted to letter ballot:

Substitute the following for the present definition for *FG* cars:

FG—Flat or gun truck car for special transportation of heavy ordnance or other heavy commodities.

The report was signed by P. W. Kiefer (chairman), chief engineer motive power and rolling stock, N. Y. C.; T. P. Irving (vice-chairman), engineer car construction, C. & O.; W. A. Newman, chief mechanical engineer, Can. Pac.; J. McMullen, superintendent car department, Erie; R. D. Bryan, engineer car construction, A. T. & S. F.; G. S. Goodwin, mechanical engineer, C. R. I. & P.; H. L. Holland, assistant engineer, B. & O.; L. R. Schuster, engineer car construction, Sou. Pac.; J. T. Soderberg, general foreman, Pennsylvania; T. M. Cannon, engineer car construction C. M. St. P. & P.; and F. J. Jumper, general mechanical engineer, Union Pacific.

Discussion

K. F. Nystrom, mechanical assistant to chief operating officer, Chicago, Milwaukee, St. Paul & Pacific, suggested that a special committee be appointed during the present emergency in order that immediate action might be obtained on developments in car construction. He also recommended to the Association the adoption of a standard design for roller-bearing axles and boxes as well as car wheels. He felt that one standard axle for roller bearings, somewhere between the 5½-in. by 10-in. and 6-in. by 11-in. sizes would meet the requirements of the railroads.

Another member thought that the tubular axle should be given special consideration at this time not only because it would save steel but it would also reduce the dead weight hauled in trains. In speaking of the tubular axle, one member wished to know what part of the increased strength obtained in this axle was due to design and how much was the result of heat treatment. In reply, W. I. Cantley, mechanical engineer, Association of American Railroads, expressed the opinion that all factors had contributed to the greater strength of the tubular axle.

H. H. Lanning, mechanical engineer, Atchison, Topeka & Santa Fe, stated that his road had 400 axles of the 7-in. by 13-in. size and no provision had been made for this size of axle in the report. Mr. Cantley replied that designs for both the 7-in. by 13-in. and the 7½-in. by 14-in. separable pedestal-type journal boxes had been prepared but had not yet been submitted. A member of the committee made the statement that the 7-in. by 13-in. journal box will be included in the recommendation.

The report was accepted and the recommendations submitted to letter ballot.

EDITORIALS

Patience and Long-Suffering—A Remarkable Example

On page 297 in this issue is a report of a proposal by President D. B. Robertson of the Brotherhood of Locomotive Firemen and Enginemen in the July issue of the union's magazine entitled "Railroad Wages—One Million Americans Can't Be Wrong." In justification of the recent demands of the transportation non-operating unions for a basic wage increase of 30 per cent, Mr. Robertson declares that railway wages are not high and that they have not kept pace with those in similar industries. "The public," he says, "in many instances is not fully aware of the patience of railroad labor, since transportation workers have not as yet been given an opportunity to participate in the improved condition of their own industry as in the case of other workers. Moreover, while the railroads are one of the country's largest industries, their employees have never known the job and wage security that the public mistakenly attributes to them."

In the table are presented the average weekly earnings, the average hours worked per week, and the average hourly earnings of employees in a number of industrial and non-industrial occupations, published by the Bureau of Labor Statistics of the United States Department of Labor. Most of these figures are averages for entire industries. In a few cases where average earnings of small groups within the industry are considerably higher than the general average for the industry, these higher paid groups have also been included.

The table also includes the railway brotherhoods and the three largest groups of railway shop employees; that is, the boiler makers, car men C and D, and machinists. The data for the railway employees were obtained from the Wage Statistics of Class I Steam Railways in the United States by converting the average total earnings and the average straight time actually worked from a monthly to a weekly basis and calculating the average hourly earnings by dividing the total compensation by the straight time actually worked.

The latest available data for industries other than transportation is for the month of February, 1941, and figures for this month have been used throughout. In order that there may be some indication of the trend in earnings, hours, and wage rates, the table also includes the data for February, 1940.

Among the highest paid groups in industry are those employed in the building of machinery, among which those employed in the manufacture of cash registers, adding machines, and calculating machines have the highest weekly earnings. Those engaged in the building of transportation equipment average particularly high, with the automobile workers taking the lead in this group. These men average over $40 a week. Another outstanding industry from the viewpoint of average weekly earnings is newspaper and periodical printing. The employees in this line of business average over $38 a week and more than $1 an hour for the time worked.

The poorest paid group among the operating brotherhoods are the yard firemen and helpers. All of these men who received pay during the month of February, 1941, averaged $36.70 a week. The next lowest paid among the brotherhoods are the freight brakemen and

A Comparison of Average Weekly Earnings, Hours Worked, and Hourly Earnings in Various Businesses

Type of business	Avg. weekly earnings		Avg. hours worked per week		Avg. hourly earnings, cents	
	Feb., 1940	Feb., 1941	Feb., 1940	Feb., 1941	Feb., 1940	Feb., 1941
Iron and steel products	$27.95	$32.25	36.5	40.7	76.4	79.1
Blast furnace and rolling mills	29.69	34.57	35.4	39.9	83.8	86.8
Machinery, excl. transportation equipment	29.67	34.28	40.1	44.2	73.7	77.1
Cash registers, etc.	32.17	36.99	39.1	43.4	82.5	86.2
Transportation equipment	33.36	38.44	37.7	42.1	89.4	91.6
Cars, electric and steam	28.83	30.66	39.1	39.3	73.8	77.4
Locomotives	28.93	34.95	37.4	43.1	77.3	81.1
Automobiles	34.74	40.05	37.2	41.1	93.5	97.5
Non-ferrous metals and products	26.65	31.12	38.4	42.1	69.6	73.9
Textile fabrics	16.98	18.60	35.7	38.3	48.4	49.2
Hats, fur felt	25.13	29.52	35.4	38.6	73.2	77.1
Wearing apparel	18.86	20.39	34.0	35.7	54.4	55.5
Leather manufactures	19.61	21.89	36.7	39.1	53.7	56.4
Food	25.00	25.25	39.5	39.5	63.9	65.1
Beverages	32.77	33.72	37.6	38.0	87.7	88.9
Paper and printing	28.37	30.01	37.8	39.1	78.3	80.3
Newspaper, periodicals, printing	37.59	38.42	35.9	35.7	101.8	105.1
Chemical, petroleum, coal products	29.31	30.22	38.4	38.8	75.5	77.0
Petroleum refining	34.78	34.44	35.9	35.7	97.5	97.0
Rubber products	27.40	31.14	35.3	39.5	77.7	78.5
Rubber tires and inner tubes	32.15	36.73	33.6	38.2	96.3	96.5
Lumber and allied products	16.69	21.41	37.9	39.7	51.3	53.6
Stone, clay, and glass products	23.71	25.62	35.4	37.2	66.2	68.3
Bituminous coal	26.02	26.77	29.8	30.4	87.7	88.7
Crude petroleum production	34.22	33.56	38.3	37.3	87.4	89.7
Electric light and power	34.94	35.72	39.8	39.6	87.4	90.6
Trade, wholesale	29.53	30.69	40.9	40.6	72.2	75.9
Trade, retail	21.44	21.59	42.9	42.7	54.5	54.6
Railway passenger conductors	60.40	62.20	34.5	35.0	175.0	177.5
Railway freight conductors:						
Through freight	51.40	54.50	36.2	38.4	142.0	141.0
Local and way freight	60.40	64.00	47.0	49.1	128.0	130.0
Railway passenger brakemen and flagmen	40.00	42.20	30.6	31.4	130.5	134.8
Railway freight brakemen and flagmen:						
Through freight	35.20	37.90	30.8	33.0	114.0	114.5
Local and way freight	42.20	45.20	40.8	42.7	103.5	106.0
Passenger enginemen and motormen	65.20	67.00	29.9	30.6	218.2	222.0
Freight enginemen and motormen:						
Through freight	57.50	62.80	34.4	37.5	168.0	168.0
Local and way freight	69.00	73.50	45.0	47.1	153.3	156.0
Passenger firemen and helpers	47.00	49.60	26.0	27.3	181.0	181.0
Freight firemen and helpers:						
Through freight	38.20	41.90	29.0	32.4	128.4	129.0
Local and way freight	45.75	49.25	38.9	41.3	117.5	119.0
Yard conductors and foremen	49.00	51.25	46.5	48.5	105.0	106.0
Yard brakemen and helpers	37.30	40.20	38.5	40.5	97.0	98.0
Yard enginemen and motormen	50.00	52.50	44.8	46.5	112.0	113.0
Yard firemen and helpers	34.15	36.70	38.7	41.2	88.3	88.5
Boilermakers	37.35	40.70	40.0	43.0	93.4	94.7
Carmen (C and D)	34.50	36.80	40.8	43.5	84.5	85.5
Machinists	37.50	40.20	40.8	43.3	92.0	94.3

flagmen in through train service whose average weekly earnings were $37.90. Then comes the yard brakemen and helpers with $40.20. The latter and yard firemen and helpers are the only two brotherhood groups who received less than $1 an hour for the straight time actually worked. The various groups of conductors and enginemen averaged from above $50 a week (yard conductors and firemen) to over $70 a week (way-freight enginemen and motormen).

One of the reasons cited by Mr. Robertson in justification for the demands for the 30 per cent basic wage increase is the rising cost of living. The Bureau of Labor Statistics of the Department of Labor publishes index numbers of the cost of living for the larger cities of the United States—an index the components of which are food, clothing, rent, fuel, electricity and ice, house furnishings, and miscellaneous, combined in the proportions common to the budgets of wage earnings and workers in the lower salary range. As of March 15, 1940, the index number stood at 99.8. As of February 15 of the current year it had risen to 100.8.

Improved Operation Reflects Better Mechanical Conditions

At the A. A. R. Mechanical Division annual meeting in St. Louis, Mo., last month, emphasis was placed on the desirability, and, in, fact, urgent necessity of railway mechanical department officers doing everything possible to assist in the rapid and safe handling of both industrial and national defense traffic on the rails. One of the reasons for present greatly improved freight handling records now being established by the railways is the fewer number of equipment delays chargeable to the development of locomotive and car defects on the road, and this achievement is definitely creditable to mechanical department supervisors and mechanical maintenance forces.

Increased motive power and car capacity, higher train speeds, more ton-miles handled per train hour, reduced repair costs and reduced unit fuel consumption, all are accomplishments in which the mechanical-department forces have played a predominant, or at least an important part. The accompanying table, for example, shows what has been done along this line by a single railroad in the 20-year period between 1920 and 1940, this railroad doubtless being by no means a rare exception. Freight-car repair costs on both an annual and a mileage basis have been reduced almost two-thirds and passenger-car repairs have been reduced 14 per cent. The factors entering into minimum expenditures for car repairs are well known and include preeminently the retirement of obsolete and worn-out cars and their replacement by new equipment which requires relatively little repair, particularly during the first few years of service life. In addition, improved design and construction and the use of more durable and more reliable structural materials have greatly extended the period between repairs and have consequently reduced costs.

Still another highly important factor in this reduction of car maintenance costs has, of course, been the concentration of repair operations in relatively few shops where, in general, more adequate modern equipment is available for performing the various reconditioning operations. Program repair work, improved welding technique and equipment and more accurate inspection and test methods also have contributed substantially to the reduction in car repair costs. By careful attention to the better mechanical conditions of trucks and journal boxes, and improved methods of reclaiming journal-box packing and oil, as specified by A. A. R. rules, the number of miles per hot box on the road in question has been increased about four times in passenger service and three times in freight service. What this means in the way of reduced delays to freight train and lessened operating cost may be readily appreciated.

As regards motive power, the influence of longer locomotive runs in boosting the potential service mileage between general repairs and intermediate terminal attention has greatly decreased unit costs. The way this works out may be illustrated by the following example: With a specified period of four years between flue and lagging removals, an intensive use of motive power which enables the service mileage to be more than doubled in the period under consideration means that the cost per mile has been decreased at least 50 per cent. In addition, the high locomotive mileage between repairs implies high potential earnings. Among other things, improved locomotive design in conjunction with water treatment, cast steel underframes, welded construction, roller bearings, the improvement of shop facilities and up-to-date maintenance methods have greatly reduced the cost of locomotive repairs on a mileage basis, and greatly increased the number of locomotive miles per failure.

Improvements in Operating Performance on One Railroad in Twenty Years

	1920	1939
Freight car repairs—cost per car	$203	$75
Freight car repairs—cost per mile	0.0166	0.0068
Passenger car repairs—cost per mile	0.0318	0.0273
All locomotive repairs—cost per mile	0.1933	0.1670
All locomotive miles per failure	12,433	66,561
Miles per hot box—passenger	450,493	1,862,397
Miles per hot box—freight	152,223	505,733
Freight train speed—miles per hour	10.3	16.4
Gross ton miles (trailing) per train hour	13,786	29,770
Gross tons (trailing) per train	1,343	1,820
Lb. coal per 1,000 gross ton-miles	150	118

On the railroad referred to in the table, freight-train speeds increased roughly 60 per cent in the 20-year period indicated and gross tons per train increased 35 per cent, about 43 per cent increase in gross ton-miles per train hour being secured. In common with other railroads, this particular line has also reduced its unit fuel consumption substantially, due in no small measure to the improved condition of motive power and car equipment. Railroad mechanical supervisors and maintenance forces are therefore confronted with a definite

challenge to continue their good work and surpass previous accomplishments, if the expected peak movement of traffic this fall is to be handled successfully.

Diesel Locomotive Operating Costs

The sub-committee on the Development and Use of Oil-Electric locomotives of the A. A. R. Mechanical Division Committee on Locomotive Construction is to be congratulated on its decision to continue the study of operating costs of Diesel-electric locomotives and, above all, on the character of the comprehensive report which was presented at the St. Louis meeting. Here, for the first time is a collection of figures from which railroad men interested in the operation of this type of motive power may get information that is of real value.

The general character of the report has been improved over previous compilations of similar operating data in many respects. One of the most acceptable improvements is the presentation of the detailed figures by individual locomotives rather than by groups of locomotives of the same horsepower or type. Hardly less important is the actual date that each locomotive was placed in service and the total hours of operation since it first entered service. With data of this character it is now possible to eliminate a great deal of the speculation that had, of necessity, to be indulged in when endeavoring to analyze many of the tabulations of cost figures previously made.

An analysis of the cost of operation in the switching locomotive group discloses some interesting facts. The 49.8 cents per hour average for the 300-hp. group compares with the 37.5-cent average for the 600-hp. group and still leaves one in the speculative frame of mind because of the lack of detail figures broken down between Diesel engine, electrical equipment and mechanical equipment, as well as the fact that the average age of the locomotives in the relatively small group is approximately 12 years while the average age of the 600-hp. group is 3.6 years. The cumulative hours-of-service figure is, of course, much greater in the former group. Another interesting fact is that in the maintenance costs of the 600-hp. group a breakdown of charges indicates 58 per cent of the total for the Diesel engine repairs; 22 per cent for electrical repairs and 20 per cent for the mechanical equipment repairs. These figures check very closely with other studies of costs of 600-hp. locomotives and inspire confidence in the figures in the report. So, also, does the 37.5 cents-per-hour average check closely with other group cost studies.

One of the real objects of speculation is the reason why the 900-hp. group of switchers, having an average age of about three years, shows an average operating cost of 71.66 cents per hour as compared with 29.8 cents an hour for the 1,000-hp. group, the average age of which is less than two years. Unfortunately, the absence of a breakdown in the repair-cost figures obscures this important part of the analysis.

The value of the figures in this report is obvious and this value will increase immeasurably as each successive year's report—we hope—adds to the details and thereby removes future analyses from the field of guesswork. It is regrettable that the committee has not found it practical to include items for enginehouse expense and "other supplies" for these items will take on importance as the Dieselization of certain terminals approaches 100 per cent.

The cost figures on road motive power provide an excellent foundation upon which to build the statistics of future operation and as the volume of detail figures for this type of power increases so also will their value.

The sub-committee, in breaking down its costs to the basis of individual locomotives, has arrived early in its life at the point where steam locomotive "cost-accountants" should have been years ago.

New Books

STEEL CASTINGS HANDBOOK. *First Edition. Published by the Steel Founders' Society of America, 920 Midland Building, Cleveland, Ohio. Over 500 pages. Illustrated. Price, $2.*

This book is offered as a dependable manual on steel castings. It should be of great interest and value to railway mechanical engineers because, as stated in the book, about 35 per cent of the weight of the modern locomotive consists of steel castings and between 16 and 18 per cent of the modern freight car comprises cast steel parts. The purpose of the book is to give authoritative answers to questions on the manufacture, use and design of steel castings.

The several methods of producing steel for castings and the actual procedure used in making the castings, from pouring to the final testing operations, are given in detail. Following chapters on the physical values and heat treatment of cast steel there is an interesting discussion of the variables affecting the properties of steel castings. Among these variables are the manufacturing process, the shape and location of the test coupons, effect of mass and design, and the elements normally present in carbon cast steel.

The properties of carbon, low-alloy, heat- and corrosion-resistant and austentitic manganese cast steel are given in separate chapters. Suggestions on the preparation of specifications as well as the important features of the more widely accepted standard steel-casting specifications are set forth. Considerable information is included on design, pattern equipment and industrial uses of steel castings. The book has been brightened up by the liberal use of illustrations which not only add to the value of the text but help to make this first edition much more interesting than the usual engineering handbook.

THE READER'S PAGE

Who Saves Coal?

To the Editor:

When an unsolved problem stays on a person's mind for a considerable length of time, he is usually enabled, by the operation of the sub-conscious mind, to arrive at some conclusion that may be helpful.

He may cudgel his brains and walk the floor to no avail, but when he is out to lunch, or taking a swim on the beach, or doing some other incidental thing in the ordinary affairs of the day, with no consciousness whatever of his problem in mind, a thought will strike him between the eyes and, for a glowing moment, he has every angle dovetailed and the whole proposition laid out in its entirety in a beautiful array of facts that harmonize each with the other in a simplicity that leaves him wondering what he has been doing all these years.

Did anybody ever think there is a connection between one of Kipling's verses and the conservation of coal? Kipling wrote:

I keep six honest serving men
(They taught me all I knew);
Their names are *What* and *Why* and *When*
And *How* and *Where* and *Who*.

In applying this to coal conservation, we have:

What saves coal.
Why save coal.
When save coal.
How save coal.
Where save coal.
Who saves coal.

Every man on the railroad who has anything to do with our coal supply can give a pretty good answer to the first five of these questions—but not until we find the answer to "Who saves coal," will our monthly and annual reports reflect a decrease in this expense.

When each wielder of the scoop has made a saving in coal, he must be made to realize that he has done something very important and his effort must be recognized with sincere and hearty appreciation.

* * *

Courtesy L. & N. Employees' Magazine

This car has been converted into a sand reservoir for supplying sand to Diesel-electric locomotives at East Louisville, Ky., on the Louisville & Nashville

We hear a lot about supervision. That is all right up to a certain point (which is probably our present level), but past experience in coal-conservation campaigns has demonstrated beyond the shadow of a doubt that "hearty appreciation" accorded when deserved bears more fruit than the most intensive supervision with its detrimental attendant discipline.

N. A. Epperson.

Keeping the Record Straight

To the Editor:

On page 243 of the June issue of the *Railway Mechanical Engineer*, under the heading "Sir Nigel Gresley," it is stated that "The contributions to railway engineering for which Sir Nigel is best known are the three-cylinder single-expansion locomotive . . . and the combination valve motion by means of which the two outside valve gears provided motion for the valves of all three cylinders.

I have previously brought to your attention the fact that Mr. Gresley was not the inventor of the valve gear referred to. This was in the form of a letter which was published in the September, 1926, issue, page 701.

On January 11, 1910, United States Patent No. 946,-083 was issued to the writer and it contained the claim: "(1) In a three-cylinder fluid-pressure engine having one central and two side cylinders, the combination of two valve-operating mechanisms, each actuating the distribution valve of one of the side cylinders independently of that of the other and means for imparting the resultant of the independent movements of said valve mechanisms to the distribution valve of the central cylinder." It will be seen at once that this claim is basic and covers any form of mechanism which achieves the result sought.

About five years after this patent was issued Mr. Gresley adopted the principle and applied it to locomotives which he built for the London & North Eastern. Subsequently he took out an English patent to cover the particular form of mechanism which he applied to these locomotives.

In January, 1923, page 5, you published a letter from the well-known English engineer, H. Holcroft, in which he acknowledges my invention and in which he further states that the London & North Eastern was at that time still using three complete sets of valve gear on their three-cylinder locomotives.

When the writer designed and patented the valve gear for three-cylinder locomotives he was associated with the American Locomotive Company and under a ruling in force at that time he was required to give to the company the right to manufacture and vend the invention without compensation.

When about 1923 the American Locomotive Company began large scale manufacture and sale of three-cylinder locomotives on which they used valve gears covered by my patent, they elected to give all credit for the valve gear to Mr. Gresley, and the probabilities are that he also received compensation for its use.

As the patent has long since expired, discussion of it is more or less academic except as a matter of keeping the record straight.

H. S. Vincent.

High Spots in Railway Affairs . . .

Collecting for Damages by Motorists

Some railroads have been quite successful in collecting for damage caused to their properties by motorists. F. A. Kelly, chief claim adjuster of the Santa Fe, in speaking before the Association of Railway Claim Agents, listed the items of expense which an automobile accident may cause a railroad. These are flat hourly and mileage charges for the use of wreck equipment, overhead, delays to traffic, cars demolished, supplies, fuel, lubricants, stores department expense, wages of labor and crews, extra wages of crews delayed, meals of wrecking crews, damage to equipment, loss of its use, rentals of equipment, flattened wheels, supervision, cargo loss, payroll tax, railroad retirement insurance, damage to freight, and loss of good will.

Freight Car Supply Problem

Railroad men sympathize with the problems that face the Car Service Division, A. A. R. W. C. Kendall, its chairman, pointed out in a recent address, "With each day comes some new demand with respect to car supply. There probably has never been a time when the problems relating to car handling were as varied as they are today. Six months ago the forecasters were prophesying a 9.4 per cent increase in car loadings in 1941. They could not then reckon with conditions which later arose. Subsequent revision raised this forecast to 12.5 per cent. For the year 1941 to date, the increase in loading volume over that of 1940 is 16.1 per cent. To what heights is it destined to reach? No one knows. Whatever it may be, it will require all the ingenuity we can bring to bear."

Car Loadings and Ton-Miles

We are accustomed to gage traffic trends and to make comparisons on the basis of the weekly freight car loadings figures. They have been showing a gratifying increase in traffic as compared to previous years, but apparently the statistics of "tons carried one mile" are much more impressive. The compilation of these figures, however, naturally lags far behind the car loading figures, which are available for the previous week on Thursday of each week. The Railway Age points out that for the first quarter of the present year the car loadings were 15 per cent greater than those of 1940, while the ton-miles figures were 19 per cent greater. This is due, in part, to better car loading, but probably more largely to the fact that the discontinuance of coastwise steamship service has made it necessary for the railroads to carry much more freight over extraordinarily long distances. This makes all the more notable the achievement of the railroads in handling the unusually great amount of freight traffic with a smaller number of freight cars, as compared to pre-depression years.

Subway Shelters in London

The Railway Gazette of London points out that while the number of shelterers in the London tube varies according to the German air activity over London and the phases of the moon, it was running at an average of about 70,000 a night in May. It has varied in recent months from 60,000 to 87,000 a night, with sleeping accommodations for 22,800 persons. Since the evening rush hour goes on until 6:30 p. m., the shelterers are asked to wait until it is over before coming to shelter. They are cautioned not to stand about in groups and to keep away from the platform edge. Several accidents have been caused by coming too near the trains. The shelterers are asked to keep their children under control and not to allow them to play on the escalators or in the lifts. A "Cockney crossword" was printed on the back of a leaflet containing the new set of rules.

Stop This Economic Waste

The railroads of the United States and Canada paid out $21,059,149 for freight loss and damage in 1940, an increase of 11.5 per cent over the preceding year. This is in line with the increase in the volume of transportation, particularly manufactured goods. The Freight Claim Division of the A. A. R. is intensifying its drive to reduce this great economic waste. It points out that, "There is more opportunity for errors when shippers and transportation companies are working under high pressure and increasing business. Therefore, plans are being formulated for greater supervision in all phases of freight handling, from the shipping room to the receiving room. This will include special methods of educating the personnel, a large number of whom are new. Special studies are also being made of loading methods to apply to the many articles to be used in national defense, the most important of which represents a wide variety of machinery products that must be handled promptly and safely. This will be emphasized in all its ramifications, and lends double importance to the joint shipper-carrier perfect shipping and careful handling campaign."

Women Cannot Lift Heavy Loads

Women on the British railways have had to replace express handlers who have been called into active service. The London & North Eastern Railway has issued a leaflet urging shippers to use smaller packages when sending them by passenger train. It includes two illustrations, one showing two women handling comparatively small packages, with the caption, "Smaller parcels—quicker transit." The other shows two women struggling to unload a heavy bale from a baggage compartment, bearing the caption, "This means delay." The leaflet points out that "Railwaymen liberated for the fighting forces are being replaced by women. Women cannot be expected to lift such heavy loads as men. Parcels must be handled expeditiously at stations and junctions. The smaller and lighter each parcel, crate or box, the quicker the service. Make your packages small and light and help in this way to speed the trains and the national effort."

Harriman Safety Awards

The Harriman Safety Awards for the best records in 1940 in their respective classes were presented on June 17 to the Norfolk & Western, in the class operating ten million locomotive-miles or more a year; the Ann Arbor, for the class operating between one and ten million locomotive-miles annually, and to the Missouri-Illinois in the group operating less than one million locomotive-miles annually. Col. John Stilwell, president of the American Museum of Safety, under whose auspices the awards were made, pointed out that passengers were three times as safe during the last ten years as they were in th 20's, six times as safe as compared with the period 1910-19, and fourteen times safer than in the first ten years of the century. Judge R. V. Fletcher, vice-president and general counsel of the Association of American Railroads, who conferred the awards, presented what he called a "brain wave" based on "my own mathematics," to the effect that the average American citizen could ride on a passenger train, traveling 50 miles an hour, 24 hours a day, and go 4,000 years before an accident occurs.

(*Turn to second left-hand page*)

YOU Can Help Us Speed Deliveries of Your NEW CHILLED WHEELS

HOW? . . . By making sure that every chilled wheel you scrap is returned at once to one of our foundries for conversion.

The wheel exchange plan, by which you receive new wheels for old on a conversion charge basis, makes this, not only the most economical, but also the fastest possible way for you to obtain the new wheels so vitally needed to keep Defense Production rolling to its destination.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

NEWS

Doctors' Degree Conferred on Hankins, McCormick, and Nystrom

THREE high-ranking mechanical officers of American railroads were awarded honorary doctorate degrees during the week beginning June 9. Fred W. Hankins, assistant vice-president (operating) of the Pennsylvania and past chairman of the Mechanical Division, Association of American Railroads, was awarded an honorary degree of Doctor of Science by Bucknell University, Lewisburg, Pa.

George McCormick, general superintendent motive power, Southern Pacific and Northwest Pacific, was awarded an honorary degree of Doctor of Engineering by the Agricultural & Mechanical College of Texas, College Station, Tex.

Karl F. Nystrom, mechanical assistant to chief operating officer, Chicago, Milwaukee, St. Paul & Pacific, was awarded an honorary degree of Doctor of Engineering by Marquette University, Milwaukee, Wis., on June 11. Mr. Nystrom was cited, among other things, for his development work in the design and construction of modern passenger train equipment. Coming to the Milwaukee in 1922 as an engineer of car design he revolutionized shop techniques on the road and designed and built in company shops lightweight rolling stock for the "Hiawatha" trains.

Load Per Car of Carload Freight Averages New High

A NEW high record in the average load per car of all freight transported in carload lots was established by Class I railroads in 1940, according to the Association of American Railroads.

In that year, an average of 37.7 tons per car for all commodities carried in carload lots was attained. This was an increase of nine-tenths of a ton, compared with the previous record established in 1939. The increase of nearly one ton in the average load was equivalent to the addition of 26,000 freight cars to the available car supply, the A. A. R. said.

Preference Rating for Freight Cars

BECAUSE of "a growing tightness" in the supply of freight cars, a limited blanket rating has been extended to 60 car builders which will aid them in obtaining scarce materials and thereby speed up their production schedules, according to an announcement by E. R. Stettinius, Jr., director of priorities, Office of Production Management, on June 19.

The rating provided in the order is A-3. This, it is explained, puts the requirements for freight-car construction and repairs behind the top needs in the A-1 classes, but puts them ahead of the less essential needs with lower ratings. The order provides that the rating can be used to facilitate the obtaining of material and equipment entering into freight-car construction, including railroad, industrial and mine freight cars. The order, it is further declared, is similar to the limited blanket rating already extended to airplane makers and builders of ships for the Maritime Commission merchant vessel program.

Car builders who use the rating, including railroads which build their own cars, can extend it to their suppliers by executing copies of the order and serving it on their sub-contractors, who, in turn, can extend the rating to their own suppliers by going through the same procedure.

In a letter accompanying the order, car builders were urged to substitute non-scarce materials for critical items wherever possible. It was suggested that wood be substituted for critical metals wherever possible and that, in addition, the car builders specify sizes and thicknesses of steel sheets and plates so as to minimize production difficulties.

The rating extended to the car builders applies not only to orders for critical materials but also to orders for cutting and other perishable tools and equipment, it was stated. The rating does not cover machine tools, however, and the rating for machine tools and similar production machinery must be obtained in the usual manner by application for preference rating certificates.

"You will employ extreme care in making use of this privilege (the preference rating) and the extension of the same to your suppliers," wrote Mr. Stettinius to the car builders, "and you will emphasize proper scheduling in the ordering of necessary material." It was also explained that the general preference order is applicable to material and equipment entering directly or indirectly at any state of construction, into the construction of freight cars by the producers who are granted the use of the A-3 rating.

The new action, states the announcement, follows a study in which it was shown that the national defense program has placed heavy demands upon the country's rail transportation system. This, in turn, has placed a corresponding burden upon producers of freight cars. Moreover, the production of materials necessary for defense has also greatly increased the demand for cars used in mines and industrial plants, according to Mr. Stettinius. Because of these facts, the minerals and metals group of the priorities division recommended that a general priorities system be established to assure freight-car producers of adequate deliveries of materials and equipment to meet their needs.

"It is expected," concludes the announcement, "that the use of this order will greatly facilitate freight-car building, will assure the builders of a constant flow of adequate supplies and will thereby facilitate the overland transportation of national defense materials."

The American Locomotive Company delivered the first 155 mm. gun carriage produced by private industry to government officers at its Dunkirk, N. Y., plant on May 15—The order was placed August 8, 1940 and the carriages are now in line-production at this plant—Weight, 20,000 lb.; top speed, 75 m. p. h.

D. & R. G. W. Streamline "Prospector" Trains

Two stainless steel Diesel-electric passenger trains, to be known as the Prospector, will be placed in overnight operation by the Denver & Rio Grande Western between Denver, Colo., and Salt Lake City, Utah, about the first of August. The trains, which are being built by the Edward G. Budd Manufacturing Company, will each consist of two cars.

Several new features will be incorporated in the trains. These include electrically operated disc brakes equipped with an electric device to prevent the sliding of wheels,

a hot-water heating plant, which secures its heat from the water in the jackets of the Diesel engines and horizontal-type Diesel-electric power plants. Each car will be a self-contained unit and each will be driven by two Hercules Diesel engines, synchronized so that they will operate in unison by a single control lever in the cab. Each axle will have an individual power drive to provide uniformity of traction.

Each train will contain reclining coach seats, sleeping sections, cabinettes (private rooms), and diner-lounge space. The trains will be air-conditioned throughout by electric-mechanical refrigeration.

Fall Car Supply

ASSUMING Association of American Railroads' estimates of next fall's carloading peak to be correct, the railroads must make further improvements in car utilization if tight situations or indeed actual shortages are to be avoided, according to data placed before the chief operating officers attending the May 26 Chicago meeting called by C. H. Buford, vice-president of the A. A. R. in charge of the Operations and Maintenance Department. The data assumed a carloading peak of 932,100 cars, and calculated the number of cars required to handle that business on the basis of car turnaround periods ranging from 11.8 days to 12.8 days.

On the basis of the present turnaround time—12.4 days—and assuming other factors remain unchanged, there is an indicated shortage of 65,005 cars. In other words, it was estimated that there will be 1,586,143 cars in serviceable condition next October; but 1,651,148 cars would be required to handle 932,100 car loads when the turnaround time was 12.4 days. To meet the estimated peak the turnaround time would have to be cut to about 11.9 days; then 932,100 car loads could be handled with 1,584,570 cars.

But it is not the purpose of the industry to leave the turnaround time or other efficiency factors unchanged, as discussions at the meeting indicated. There was recognition of the fact that the carriers must continue to do a satisfactory job if certain groups ready to plug for government operation are to be disappointed and made mute. Thus the suggested set of principles governing the handling of equipment in the interest of elimination of car waste which came out of the meeting, and other like proposals brought out in the discussion.

The suggested set of principles includes 14 items relating to the more efficient handling of carload freight, and a like number relating to l. c. l. traffic. Among the latter are those calling for a review of the possibilities of substituting motor-truck service for branch line and intra-terminal switching operations. It was pointed out in the former connection that the Pennsylvania operates 107 station-to-station truck routes, saving 535 box cars daily, while a daily saving of 1,000 cars results from P. R. R. trucking in lieu of intra-terminal switching.

In the data which was placed before the chief operating officers, the estimate of 1,586,143 serviceable cars for next October 1 is built up as follows: Ownership on May

(*Continued on second left-hand page*)

Orders and Inquiries for New Equipment Placed Since the Closing of the June Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos.	Builder
Atlantic Coast Line	9	2,000-hp. Diesel-elec.	Electro-Motive Corp.
Boston & Maine	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	2	660-hp. Diesel-elec.	
Canadian National	15	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	5	1,000-hp. Diesel-elec.	American Loco. Co.
	35	4-8-4	Montreal Loco. Wks.
Canadian Pacific	20	4-6-2	Canadian Loco. Wks.[1]
Conemaugh & Black Lick	2	0-8-0	Lima Loco. Wks.
Great Northern	3	600-hp. Diesel-elec.	Electro-Motive Corp.
	10	1,000-hp. Diesel-elec.	
	1	2,700-hp. Diesel-elec. frt.	
	2	4,050-hp. Diesel-elec. frt.	
	2	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
Kansas City Southern	2	2,000-hp. Diesel-elec.	Electro-Motive Corp.
Louisville & Nashville	4	660-hp. Diesel-elec.	Baldwin Loco. Wks.
	4	660-hp. Diesel-elec.	American Loco. Co.
	4	660-hp. Diesel-elec.	Electro-Motive Corp.
Nashville, Chattanooga & St. Louis	10	4-8-4	American Loco. Co.
	2	660-hp. Diesel-elec.	
	1	660-hp. Diesel-elec.	Baldwin Loco. Wks.
	1	1,000-hp. Diesel-elec.	
	1	660-hp. Diesel-elec.	Electro-Motive Corp.
	1	1,000-hp. Diesel-elec.	
New York Central	7	600-hp. Diesel-elec.	Electro-Motive Corp.
	1	600-hp. Diesel-elec.	Baldwin Loco. Wks.
	7	350-hp. Diesel-elec.	General Elec. Co.
	15	4-8-2	American Loco. Co.
New York, Chicago & St. Louis	15	2-8-4	Lima Loco. Wks.
Pennsylvania	12	21,000-gal. tenders[2]	Co. shops
Portland Terminal Co.[3]	1	1,000-hp. Diesel-elec.	American Loco. Co.
	1	660-hp. Diesel-elec.	
Union Pacific	20	4-6-6-4	American Loco. Co.
United States Interior Dept.	1[4]	4-8-2	Baldwin Loco. Wks.
United States Navy Dept.	2	50-ton Diesel-elec.	General Elec. Co.
United States War Dept.	4	60-ton Diesel-elec.	General Elec. Co.
	1	**45-ton Diesel-elec.**	
	5[5]	2-8-2	American Loco. Co.
Western Pacific	3	5,400-hp. Diesel-elec.	Electro-Motive Corp.

LOCOMOTIVE INQUIRIES

Argentine Naval Commission	1	2-8-2	.....
Central of New Jersey	2	1,000-hp. Diesel-elec.	.....
	8	600-hp. Diesel-elec.	.....
Clinchfield	10	4-6-6-4	.....
Louisville & Nashville	18-22	Steam pass.	.....
Pennsylvania	2 or 3[6]	0-6-0	.....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
Atchison, Topeka & Santa Fe	2,000	Box	Pullman-Standard
Baltimore & Ohio	1,000	Box	Pullman-Standard
Boston & Maine	200	40-ton box	Magor Car Corp.
	500	50-ton flat bottom gond.	Bethlehem Steel Co.
	100	50-ton twin hopper coal	
Chicago & Eastern Illinois	500	50-ton box	Mt. Vernon Car Mfg.
Chicago, Rock Island & Pacific	800	50-ton box	Pressed Steel Car
Delaware & Hudson	35	70-ton container	American Car & Fdry.
Elgin, Joliet & Eastern	250	70-ton side dump hopper	American Car & Fdry.
	250	70-ton side dump hopper	Ralston Steel Car
Erie	5	90-ton flat	Greenville Steel Car
Great Northern	1,000	50-ton box	Pullman-Standard
	500	50-ton box	Pressed Steel Car
	500	50-ton box	General American
Gulf, Mobile & Ohio	850	40-ton box	American Car & Fdry.
	150	50-ton hopper	
Kansas City Southern	200	50-ton box	Pullman-Standard
Lehigh & New England	300	50-ton coal	Pressed Steel Car
	100	70-ton covered hopper	American Car & Fdry.
Lehigh Valley	500	Gondolas	Bethlehem Steel
	400	50-ton box	Pressed Steel Car
	100	55-ton auto box	American Car & Fdry.
Maine Central	400	40-ton box	Magor Car Corp.
	100	50-ton coal	Bethlehem Steel
	10	70-ton covered hopper	American Car & Fdry.
	5	50-ton box	Mt. Vernon Car Mfg.
Missouri Pacific	50	70-ton covered hopper	Mt. Vernon Car Mfg.
	200	50-ton automobile	
	800	50-ton box	American Car & Fdry.
Nashville, Chattanooga & St. Louis	500	Box	Pullman-Standard
	300	Gondola	
New York Central	1,000	50-ton box	[6]
	500	70-ton gondola	Despatch Shops
Norfolk & Western	1,000	70-ton hopper	Virginia Bridge
	500	70-ton hopper	Bethlehem Steel
Northern Pacific	1,350	50-ton box	American Car & Fdry.
	200	Ballast	
	500	Box	Pullman-Standard
Pennsylvania	2,700	50-ton hopper	[2]
	2,000	50-ton box	
	800	70-ton gondola	
	500	70-ton covered hopper	Co. shops
	10	125-ton flat	
	10	125-ton well	
Reading	500	70-ton gondola	Bethlehem Steel
Southern	100	70-ton cement	Greenville Steel Car
United States Army & Navy Munitions Board	4	70-ton flat	Greenville Steel Car
Wabash	1,000[7]	Box	Co. shops
	15	70-ton cement	American Trans. Corp.
Wabash Car & Equip. Co.	10	70-ton covered hopper	American Car & Fdry.
Western Maryland	200	Box	Pressed Steel Car
	300	Hopper	Bethlehem Steel
	200	Gondola	Greenville Steel Car
	25	Flat	
Western Pacific	350	50-ton box	Mt. Vernon Car Mfg.
	300	50-ton flat	

(*Continued on second left-hand page*)

33 1/3% increase in "T

(WITHOUT INCREASING THE SIZE OF THE LOCOMOTIVE)

by application of...

The steam locomotive is possessed of latent power which now can be released by The Franklin System of Steam Distribution. This system, which is applicable to existing as well as new steam locomotives, is the result of years of experimentation, research and road tests and is offered to the railroads as a means of increasing train speed and load capacity without increasing the size of the locomotive.

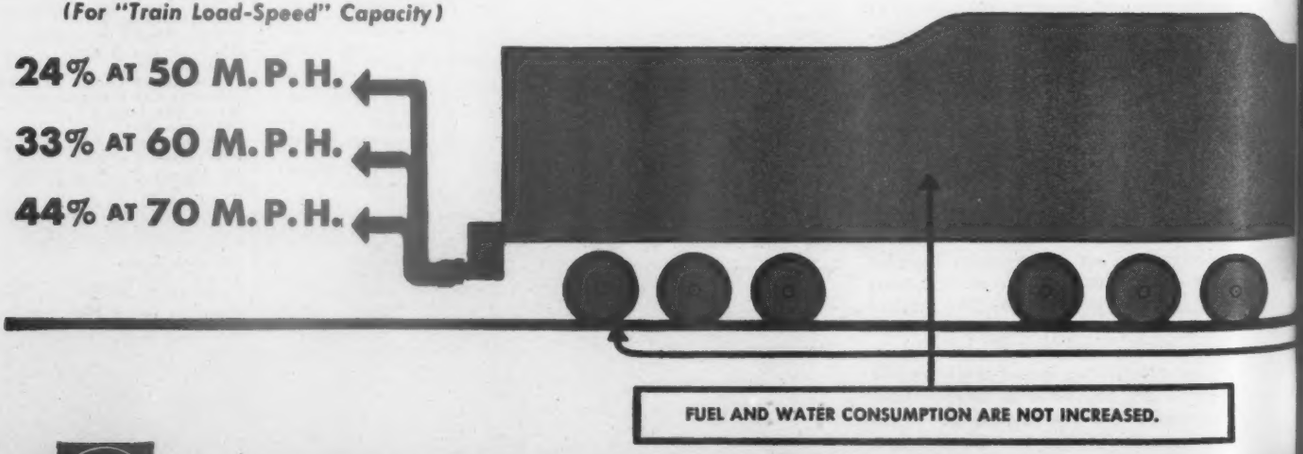
INCREASED DRAWBAR HORSEPOWER

(For "Train Load-Speed" Capacity)

24% AT 50 M.P.H.

33% AT 60 M.P.H.

44% AT 70 M.P.H.



FUEL AND WATER CONSUMPTION ARE NOT INCREASED.

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FRANKLIN RAILWAY SUPPLY

In Canada: Franklin Railway

FREIGHT-CAR INQUIRIES

Akron, Canton & Youngstown	100	50-ton hopper	
	30	70-ton gondola	
Central of Georgia	150	50-ton auto box	
	50	50-ton box	
	50	50-ton flat	
Central of New Jersey	500-1,000	70-ton gondolas	
Chicago, Rock Island & Pacific	800-1,000	50-ton box	
	200-250	50- or 70-ton coal	
Chicago, St. Paul, Minneapolis & Omaha	1,000	50-ton box	
	250	50-ton gondola	
Delaware, Lackawanna & Western	750	50-ton box	
Denver & Rio Grande	100	70-ton flat	
New York Central	750	50-ton box	
	250	55-ton box	
	500	70-ton gondola	
Sanderson & Porter Co.	50	50-ton box	
Seaboard Air Line	1,000	50-ton box	
	100	Flat	
	100	70-ton hopper	
	50	Covered hopper	
Southern Pacific	2,100	Box	
	500	Auto-box	
	700	Gondola	
	300	Flat	
	250	Tank	
	150	70-ton hopper	
Wabash	100	70-ton gondola	

PASSENGER-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
Atlantic Coast Line	8	Coaches	Edw. G. Budd
	3	Coach-bagg.-dorm.	
	1	Dining-lounge	
	2	Tavern	
	2	Dining	
Chicago, Indianapolis & Louisville	7	Baggage	St. Louis Car
Erie	7	Bagg.-exp.	American Car & Fdry.
Nashville, Chattanooga & St. Louis	10[8]	Parlor	Pullman Co.
Western Pacific	4	Chair	Edw. G. Budd

[1] Order incorrectly reported in the June issue as having been placed with the Montreal Locomotive Works.
[2] For early 1942 delivery. The Pennsylvania equipment program, comprising 15 electric locomotives designed both for passenger- and freight-train service, 12 steam locomotive tenders, 6,020 freight cars, and 50 cabooses, will cost more than $23,000,000.
[3] A joint affiliate of the Boston & Maine and Maine Central.
[4] For the Alaska Railroad. To cost $110,000.
[5] These locomotives were incorrectly reported as 2-6-2 type in the June issue. They are for service in Newfoundland.
[6] Unconfirmed.
[7] Building authorized by court; cost, $3,388,000.
[8] Used cars to be converted into day coaches.

1 was 1,646,956 cars; add thereto 56,502 cars now on order; subtract therefrom 25,000 cars to be retired from May 1 to October 1; gives 1,678,458 cars, representing approximate ownership on October 1. Then it was assumed that bad order cars would amount to 5.5 per cent of ownership, reducing the total serviceable to the 1,586,143. The calculations as to the number of cars required on the basis of different turnaround periods were set up for an assumed weekly peak of 995,500 cars as well as the 932,100 mentioned at the outset. If the peak reached the former proportions, while the turnaround time remained at 12.4 days and other factors remained static, it would require a supply of 1,763,457 serviceable cars to handle the business.

Wages Before Cars, Union Chief Says

SO THAT railroad employees will not have to forego "the righteous increase in income necessary to take care of rising costs of living," the cars and equipment required solely for national defense should be paid for by the taxpayers. This is the proposal made by President D. B. Robertson of the Brotherhood of Locomotive Firemen & Enginemen in an article to appear in the July issue of the union's magazine entitled "Railroad Wages—One Million Americans Can't Be Wrong." Writing to justify the recent demands by the transportation and non-operating unions for a basic wage increase of 30 per cent, the brotherhood chief declares at the outset that "railroad wages are not high and they have not kept pace with those paid in similar industries." That the idea of increased rates and fares may be involved in the subject is indicated by his statement that "the plight of the railroad employee as a class deserves more consideration from the public than he has enjoyed up to this time."

Discussing the ability of the carriers to absorb the burden of increased wages, Mr. Robertson argued that: "With carloadings promising to reach an all-time high by the end of this year, rail earnings are skyrocketing and will in all probability exceed the billion dollar mark." And elsewhere, "Labor demands an increased participation in today's railroad prosperity. Labor's unit of productivity has increased about 43 per cent in the past four years and it now demands a share. If workers did not share in the benefits flowing from improved efficiency and technological improvements, there would be no advance in the standard of living."

An editorial which appeared in the Railway Age of May 31 characterizing the move for increased wages as "just plain suicide for both the railroads and their employees" comes in for rough treatment in the article. Of the stand taken by Railway Age that the railroads need money to buy equipment for national defense, he writes in part:

"This is a self-respecting democratic government. It pays for what it gets. It is foreign to our way of thinking to believe that the government would expect railroad labor to continue along at inadequate wages so that it could donate towards the purchase of additional equipment made necessary by national defense efforts. In all other industries, the government is quite willing to pay, and does pay, the cost of extra equipment required by reason of national defense demands. If more cars and equipment are required solely for national defense, then that is a legitimate expense of national defense and should be treated as such. The burden should not be put upon the workers in the industry, who with their families, represent about five million people."

A. S. M. E. Officers Nominated

NOMINATIONS for 1942 officers of the American Society of Mechanical Engineers were announced on June 19 by A. L. Kimball, chairman of the regular nominating committee which held sessions during the semi-annual meeting of the society in St. Louis, Mo., June 16 to 19, inclusive. Names presented by the committee are: President, J. W. Parker, vice-president, Detroit Edison Company; Vice-Presidents: C. F. Freeman, vice-president, Manufacturers Mutual Fire Insurance Company; C. B Peck, managing editor, *Railway Mechanical Engineer* and mechanical department editor, Railway Age; W. H. Winterrowd, vice-president, Baldwin Locomotive Works, and W. R. Woolrich, dean of engineering and director, Bureau of Engineering Research, University of Texas; Managers: W. G. Christy, smoke abatement engineer, Hudson county, N. J.; H. L. Eggleston, manager, Gas and Refining departments, Gilmore Oil Company, and T. S. McEwan, resident manager-engineer, McClure, Hadden & Orthan.

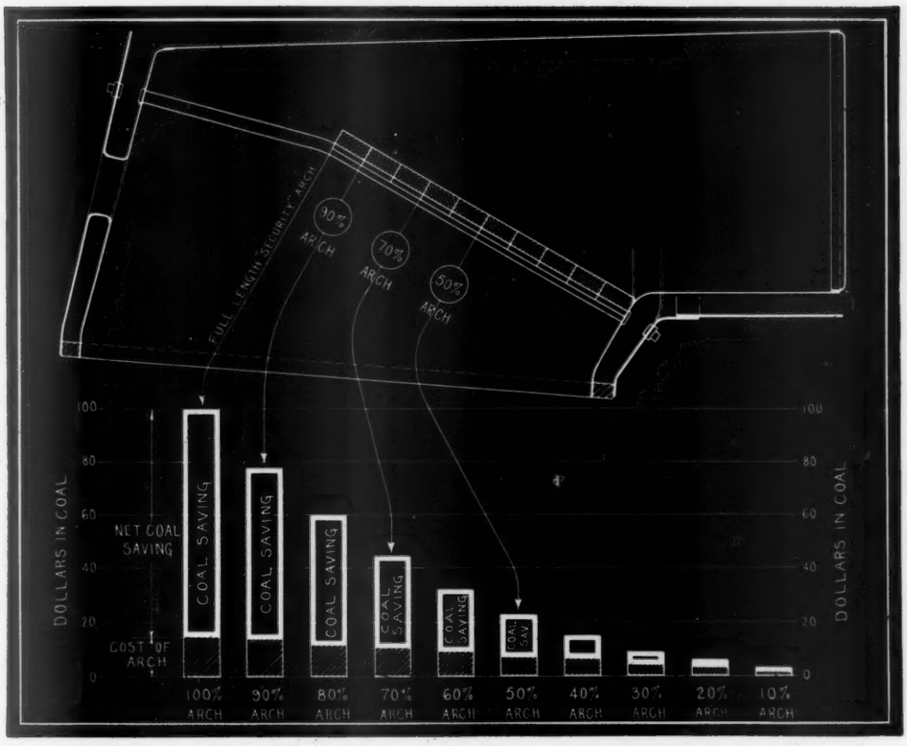
U. P. Shops at Cheyenne Damaged by Fire

DAMAGE, estimated at $1,000,000, was caused by a fire in the Cheyenne, Wyo., shops of the Union Pacific on May 19. The fire was thought to have started in the wheel shop, from which it spread to other buildings covering a block and a half. The enginehouse, locomotive shop and office building were not damaged.

Old Employees Guests of Lima Locomotive Works

Two hundred ninety employees of the Lima Locomotive Works, Inc., with service records of 25 or more years, guests of the company at dinner at Lima, Ohio, on June 10, were told by H. O. Bentley, the company attorney, in a brief address, that they were participating in a level of material prosperity that their children and children's children would never know. He urged them to "keep a tight hold on their chairs" and to avoid the hysteria which in some localities is creating a state of anarchy in industries essential to national

(*Continued on next left-hand page*)



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With the emphasis being placed on saving every railroad dollar, the locomotive Arch becomes increasingly important.

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defense. During the dinner, at which Samuel G. Allen, chairman of the board, presided, gold-and-enamel pins were presented to the 25-year-and-up employees who represent nearly 12 per cent of the total payroll.

Felicitations were extended by John E. Dixon, president, and L. A. Larsen, vice-president, of the company, and H. F. Ball, president of the Franklin Railway Supply Company, who has been a director of Lima for 25 years.

Willkie Pays High Tribute to Sam Pryor, Jr.

WENDELL L. WILLKIE, in a brief address at a luncheon to Samuel F. Pryor, Jr., held at the Hotel Commodore, New York, on June 23, paid high tribute to Mr. Pryor's qualities as a friend and "the most regular fellow" it had been his pleasure to meet. The luncheon, presided over by Charles A. Braden, general traffic manager of the National Distillers Products Corporation, and attended by over 350 railway, railway supply, and industrial traffic men, was on the occasion of Mr. Pryor's leaving the railway supply field to enter air transport as vice-president and assistant to the president of the Pan American Airways Corporation. Others who spoke were William F. Cutler, president of the Southern Wheel Division, American Brake Shoe and Foundry Company, to whom Mr. Pryor had been assistant; Juan T. Trippe, president and general manager, Pan American Airways Corporation, and Charles C. Hubbell, general purchasing agent, D. L. & W.

In response to his tribute, Mr. Pryor, who was Republican national committeeman from Connecticut, declared that Mr. Willkie stood for all that free enterprise means and that if we do not protect it, our form of government will fail. He added that this is the only reason why he has been in politics.

Equipment Purchasing and Modernization Programs

Atlantic Coast Line.—The A. C. L. has asked the Interstate Commerce Commission for authority to assume liability for $7,880,000 of equipment trust certificates, maturing in 10 equal annual installments of $788,000 on July 1 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $8,762,000 and consisting of 1,600 all-steel, wood-lined, single door, 50-ton box cars; 700 all-steel, wood-lined, 50-ton automobile box cars; 300 all-steel, wood-lined, 50-ton furniture-automobile box cars; 200 all-steel, wood floor, high side, 50-ton gondola cars, and 100 all-steel, 70-ton phosphate cars. Orders for this equipment were reported in the June issue.

Atchison, Topeka & Santa Fe.—A contract has been awarded the Ellington-Miller Company, Chicago, for the construction of additional facilities in the Eighteenth Street yard at Chicago, as follows: Fuel-oil facilities for steam locomotives, Diesel-oil facilities for Diesel locomotives, engine-washing platforms, drain lines, concrete platforms in the coach yard and two repair pits at the Diesel shop. The contract for the electrical work in connection with these facilities was awarded to the Super Electric Construction Company, Chicago. The total cost of the work will be approximately $200,000.

Canadian Pacific.—A contract for a one-story machine shop at Calgary, Alta., has been awarded the Poole Construction Co., Ltd., Edmonton, Alta. The building will occupy an area of 90 ft. by 160 ft. and will have a steel frame and brick walls. Two repair tracks will extend through the building and a 20-ton overhead crane and a drop pit table will be installed. The approximate cost of the building will be $95,000.

Central of Vermont.—The Central of Vermont is reported to be contemplating the purchase of 50 box cars of 40 tons' capacity.

Chesapeake & Ohio.—The C. & O. has asked the Interstate Commerce Commission for authority to assume liability for $3,100,000 of equipment trust certificates, bearing interest at not more than 2½ per cent and maturing in 10 equal annual installments on June 15 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $3,961,339 and consisting of 10 class H-8 freight locomotives of the 2-6-6-6 type with 25,000 gallon tenders; 8 class L-2 passenger locomotives of the 4-6-4 type with 21,000 gallon tenders; and 2 class J-3-A passenger locomotives of the 4-8-4 type with 22,000 gallon tenders. Orders for the 4-6-4 and 4-8-4 type locomotives were reported in the March issue.

The road is reported to be in the market for 2,000 freight cars comprising 1,000 box cars of 50 tons' capacity and 1,000 hopper cars of 50 tons' capacity.

Chicago & North Western.—The C. & N. W. has asked the Interstate Commerce Commission for authority to assume liability for $2,325,000 of equipment trust certificates, maturing in annual installments beginning July 1, 1942, and ending July 1, 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing $3,100,000 and consisting of 1,000 50-ton, 40-ft. 6-in., all-steel box cars. Orders for this equipment were announced in the June issue.

Chicago, Burlington & Quincy.—Directors of the Burlington have approved a 1942 equipment program calling for the construction of 4,425 freight cars in its shops at Galesburg, Ill., and Havelock, Neb., for the Burlington, the Colorado & Southern and the Ft. Worth & Denver City. The purchase of locomotives and passenger-train cars is still being considered. The freight cars to be constructed in 1942 are as follows:

C. B. & Q.

300	53½-ft. 50-ton flat
250	50-ton hopper
200	40-ton stock
70	65-ft. mill type gondola
50	70-ton all-steel covered hopper
250	70-ton hopper
1,500	40½-ft. 50-ton steel sheathed box
500	50-ft. 50-ton steel sheathed box
175	50-ft. automobile with loading devices
3,295	

C. & S.

100	53½-ft. flat
30	65½-ft. mill type gondola
500	40½-ft. 50-ton steel sheathed box
630	

Ft. W. & D. C.

500	40½-ft. 50-ton steel sheathed box

Chicago, St. Paul, Minneapolis & Omaha.—The C. St. P. M. & O. has ap-

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* * *

Twelve-ton light combat tanks roll off the assembly line of the American Car and Foundry Company's plant at Berwick, Pa., at the rate of nine tanks per day. By July 15 rate will be 15

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An example of modern power — equipped with an Elesco small-flue superheater and an Elesco feedwater heater.

remember that at high rates of operation the greatest part of the heat from fuel is absorbed by the flues . . . and the true heat absorbing efficiency of a flue is increased by either *decreasing* the diameter or *increasing* the length of the flue.

The Elesco design of superheater unit for small flues with 3½″ to 4″ o.d. diameter compares with a flue diameter of 5½″ o.d. for standard Type A superheaters . . . and results in a decided increase in heat absorbing efficiency for the small flue design.

The small-flue-design of superheater also effects a substantial increase in superheating surface and steam area and consequently higher superheat; and higher degrees of superheat mean better cylinder efficiency . . . be sure you specify the Elesco small-flue-design of superheater for your new power.

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plied to the Interstate Commerce Commission for approval of a sale to the Reconstruction Finance Corporation of $1,680,000 of 2½ per cent equipment trust certificates at par and accrued dividends. The certificates, dated July 1, 1941, would mature in 15 equal annual installments on July 1 of each year from 1942 to 1956. The transaction would finance the acquisition from the American Car & Foundry Company of 700 all-steel box cars of 50 tons' capacity. The order for this equipment was announced in the April issue.

Florida East Coast.—The F. E. C. is reported to be contemplating the purchase of several Diesel-electric locomotives.

Grand Trunk Western.—The G. T. W. has asked the Interstate Commerce Commission to approve a plan whereby it would issue and sell to the Reconstruction Finance Corporation $5,692,000 of 2½ per cent equipment trust certificates, maturing in 20 semi-annual installments on June 1 and December 1 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $7,116,150 and consisting of 25 U-3-b northern type steam locomotives; 20 Diesel-electric locomotives; 300 all-steel, 40-ton automobile cars; 200 all-steel, 70-ton gondola cars, and 100 all-steel, 70-ton flat cars. Orders for the freight cars were announced in March.

Great Northern.—A system-wide maintenance, improvement and equipment program for 1941, involving an expenditure of $48,500,000 and affording summertime employment to an additional 4,000 men, has been announced by the Great Northern. The program, which already is underway in the ten states in which the company operates, provides for: Maintenance of way, structures and equipment—$25,135,000; additional facilities and improvements to existing facilities and equipment—$5,793,000; purchase of new equipment—$17,498,000.

This year's maintenance and improvements will be a continuation of a program begun several years ago, said F. J. Gavin, president, but will cost substantially less than in 1940, and will be approximately $1,000,000 under the average annual expenditures for maintenance work in the five-year period, 1936 through 1940. However, Mr. Gavin added that the national defense program has increased demands for cars and motive power, necessitating purchases of more new equipment than in 1940.

New equipment listed in this year's program includes: 4,000 new box cars, half of which were received the first quarter of this year, with delivery of the remaining 2,000 scheduled to begin in October (order reported elsewhere in this issue); 20 Diesel-electric locomotives of varied power for switching and road service throughout the system, and 15 N-3 type steam locomotives. The latter engines are now under construction in Great Northern shops. An order for two Diesel-electric locomotives was announced in January; orders for 18 are announced elsewhere in this issue.

Louisville & Nashville.—The L. & N. has asked the Interstate Commerce Commission for authority to assume liability for $4,970,000 of equipment trust certificates, maturing in 10 equal annual installments of $497,000 on June 15 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $5,522,223 and consisting of 1,000 50-ton, all-steel hopper cars, 1,000 50-ton, steel-sheathed, wood-lined box cars, and 100 50-ton, all-steel, wood-lined, double-door box cars. Orders for this equipment were announced in the May issue.

Montour.—The Montour has asked the Interstate Commerce Commission for authority to assume liability for $500,000 of equipment trust certificates, bearing interest at not more than 2½ per cent and maturing in five equal annual installments on June 16 in each of the years from 1942 to 1946, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $702,381 and consisting of 300 all-steel, 50-ton hopper cars. The order for this equipment was announced in the May issue.

Nashville, Chattanooga & St. Louis.—The N. C. & St. L. company has asked the Interstate Commerce Commission for authority to assume liability for $4,290,000 of equipment trust certificates, maturing in 10 equal annual installments of $429,000 on July 15 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $4,766,667 and consisting of 10 4-8-4 steam locomotives; four 660-hp. Diesel-electric switching locomotives; two 1,000-hp. Diesel-electric switching locomotives; 500 steel-sheathed, wood-lined box cars of 40 tons capacity; 200 all-steel hopper coal cars of 50 tons capacity; and 300 all-steel, solid-bottom gondola cars of 50-ton capacity. The order for 200 hopper coal cars was announced in the May issue. Orders for the locomotives and other freight cars are announced elsewhere in this issue.

New York Central.—The N. Y. C. has asked the Interstate Commerce Commission for authority to assume liability for $15,000,000 of equipment trust certificates, maturing in 10 equal annual installments of $1,500,000 on July 15 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $16,808,333 and consisting of 4,000 55-ton steel box cars; 1,000 70-ton, high side, gondola cars; 15 oil-electric switching locomotives; and fifteen L-3c Mohawk type freight locomotives. Orders for 1,000 box cars and 1,000 gondola cars were announced in the May issue and 3,000 box cars in the June issue. The locomotive orders are announced elsewhere in this issue.

New York, Chicago & St. Louis.—The Nickel Plate has asked the Interstate Commerce Commission for authority to assume liability for $1,250,000 of equipment trust certificates, bearing interest at not more than 2½ per cent and maturing in 10 equal annual installments of $125,000 on June 15 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $1,463,275 and consisting of 18 70-ton covered hopper cars and 500 50-ton, 40 ft. 6 in., all-steel box cars. The order for the box cars was announced in the May issue and the order for the covered hopper cars in the June issue.

New York, New Haven & Hartford.—The New Haven has asked the Interstate Commerce Commission for authority to assume liability for $2,890,000 of equipment trust certificates, maturing in 10 equal annual installments of $289,000 on July 1 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $3,618,000 and consisting of 10 100-ton Diesel-electric switching locomotives, 6 44-ton Diesel-electric switching locomotives, and 1,000 all-steel box cars. An order for six 44-ton Diesel-electric locomotives was reported in the June issue and orders for ten 660-hp. Diesel-electric locomotives and 1,000 box cars in the April issue.

New York, Susquehanna & Western.—The Susquehanna will shortly place orders for two Diesel-electric locomotives of 1,000 hp. each. This company is also seeking Federal court authority for the purchase of an additional six Diesel-electric units of 1,000-hp.

Northern Pacific.—The Northern Pacific has asked the Interstate Commerce Commission for authority to assume liability for $5,700,000 of equipment trust certificates, maturing in 10 equal annual installments on July 15 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $6,425,000 and consisting of 1,850 steel-sheathed box cars and 200 all-steel, 70-ton selective ballast bars. Orders for this equipment are reported elsewhere in this issue.

Pennsylvania.—A contract has been awarded to the Ellington Miller Company of Chicago for the construction of an extension to the company's enginehouse at 55th street, Chicago.

Pere Marquette.—The Pere Marquette has asked the Interstate Commerce Commission for authority to assume liability for $2,775,000 of equipment trust certificates, bearing interest at not more than 2½ per cent and maturing in 15 equal annual installments of $185,000 on June 1 in each of the years from 1942 to 1956, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $3,513,761 and consisting of 300 50-ton, all-steel box cars; one hundred 40-ton, all-steel automobile-furniture box cars; 25 50-ton, all-steel automobile box cars; 75 50-ton, all-steel single door automobile box cars; twenty-five 70-ton, all-steel covered hopper cars; 40 30-ton, all-steel caboose cars; and twelve class N-1 freight locomotives, type 2-8-4 with 22,000 gallon tenders. Orders for this equipment were reported in the March, April, and June issues.

Southern.—A drop pit and inspection pits for Diesel locomotives, and an extension to the tank shop are being constructed by the company forces at Chattanooga, Tenn. The cost of the work will be approximately $34,500.

The Southern has asked the Interstate Commerce Commission for authority to assume liability for $11,250,000 of equip-

(*Continued on fifth right-hand page*)

ment trust certificates, maturing in 10 equal annual installments of $1,125,000 on July 1 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $12,517,000 and consisting of three thousand four hundred box cars, five hundred flat cars, one hundred gondola cars, five Diesel-electric switch engines, and 25 baggage-express cars. Orders for the freight-car equipment and the baggage-express cars were announced in the June issue.

Southern Pacific.—The Southern Pacific has asked the Interstate Commerce Commission for authority to assume liability for $14,625,000 of 2¼ per cent equipment trust certificates, maturing in 15 equal annual installments of $975,000 on June 1 in each of the years from 1942 to 1956, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $18,281,250 and consisting of 40 4-8-8-2, Class AC-10, oil-burning locomotives with 22,000-gal. rectangular tenders; 10 4-8-4 semi-streamlined oil-burning locomotives with 23,500-gal. rectangular tenders; 2,500 steel-sheathed, wood-lined box cars, and 50 tight-bottom gondola cars. Orders for this equipment were announced in the April and May issues.

The purchase of an additional number of steam locomotives of the 4-8-8-2 type is being considered by the road.

Wabash.—The Wabash has been authorized by the district court to purchase two 660-hp. Diesel-electric switching locomotives at a cost of $120,000 and 25 hopper cars at a cost of $98,000, and to build in its own shops 1,000 box cars at a cost of $3,388,000.

Supply Trade Notes

NORMAN L. DEUBLE, formerly assistant to the vice-president of the Copperweld Steel Company, Warren, Ohio, has been appointed manager of sales.

◆

ALVA E. RADCLIFFE, sales representative of Thomas A. Edison, Inc., with headquarters at Chicago, has been promoted to Cleveland district manager, to succeed Peter R. Nelson, deceased.

◆

A. F. DOHN, vice-president in charge of tool steel sales of the Allegheny Ludlum Steel Corporation, has retired from active service and will continue with the company in a consulting capacity as a vice-president.

◆

C. A. BROWN, formerly of the Washington, D. C. office of the American Locomotive Company, has been appointed district sales manager with headquarters in the Red Rock Building, 187 Spring St., N. W., Atlanta, Ga.

◆

NATIONAL TUBE COMPANY.—*C. R. Cox* has been elected executive vice-president of the National Tube Company, a subsidiary of the United States Steel Corporation, succeeding *B. C. Moise*, who has retired after more than 50 years continuous service. *Elmer N. Sanders*, formerly assistant vice-president, operations, has been elected vice-president in charge of operations to succeed Mr. Cox.

◆

SAMUEL F. PRYOR, JR., has severed his connection with the American Brake Shoe & Foundry Company, and the Southern Wheel division of that company and has been elected vice-president and assistant to the president of the Pan-American Airways Corporation. Mr. Pryor had been associated with the American Brake Shoe & Foundry Company for 17 years.

◆

E. C. GUNTHER, formerly a buyer in the purchasing department of the Chicago, Burlington & Quincy, has been appointed district manager, midwest territory, of the Duff-Norton Manufacturing Company, with headquarters at Chicago, to succeed Alex S. Anderson, deceased. Mr. Gunther was born in Chicago on February 5, 1889. He entered the employ of the Chicago, Burlington & Quincy in 1916 and since has held the positions of bookkeeper, tracing clerk, scrap clerk and buyer in the purchasing department.

◆

GEORGE I. WRIGHT, who has heretofore represented the Coppus Locomotive Equipment Company, Worcester, Mass., among Eastern railroads, has been appointed to represent the Coppus company on railroads having general offices in the states of Ohio, Indiana, Illinois, Michigan, Wisconsin, Nebraska, Iowa, and Minnesota. Mr. Wright was formerly with the Reading, Illinois Central and Southern Pacific railroads.

◆

THE GEORGE C. LEVER COMPANY has been appointed Lo-Head Electric Hoist representative for the American Engineering Company in the Northern New Jersey, Greater New York and Long Island territory. George J. Sturmfelsz will represent the company in the State of Delaware; H. E. Mensch in the Detroit, Mich. territory and the American Steel Export Company of New York in certain foreign markets.

◆

J. ARTHUR DEAKIN has been appointed Eastern District Manager for McKenna Metals Company, Latrobe, Pa., manufacturers of Kennametal steel-cutting carbide tools and blanks. Mr. Deakin will be in charge of the new Eastern sales office of McKenna Metals at 50 Church St., New York City, and will serve the New England States and northern New Jersey.

J. A. Deakin

Mr. Deakin has been engaged continuously in the carbide tool business since its inception in this country in 1928, and for many years previous was active in the machine tool field. He was appointed Eastern representative by McKenna Metals Company when Kennametal was introduced in 1938.

◆

MANNING, MAXWELL & MOORE, INC.—William D. McCarley has been appointed Pacific Coast representative of the locomotive equipment division of Manning, Maxwell & Moore, Inc., with headquarters in San Francisco. He replaces Newton B. Selover, who has been transferred to the Chicago district. Mr. McCarley had been chief electrician of the Eastern division of the Western Pacific for the past five years and prior thereto was with the Denver & Rio Grande Western shops.

Obituary

DUDLEY BREWSTER BULLARD, vice-president of the Bullard Company of Bridgeport, Conn., died June 10 after a long illness.

◆

ROBERT L. CAIRNCROSS, district sales manager of the National Lock Washer Company, Newark, N. J., with headquarters at Chicago, died in Tucson, Ariz., on June 13.

◆

CHARLES B. JAHNKE, president and general manager of The Cooper-Bessemer Corporation, died of a heart attack at Mercy Hospital in Mount Vernon, Ohio, May 6. He was 52 years old.

◆

CHARLES E. MILLER, a representative in Chicago of the Universal Locomotive Arch Company, died suddenly of heart failure in that city on June 8. Mr. Miller has been with the Universal Locomotive Arch Company for 20 years and previously served with the American Arch Co., Inc., and the Chicago & North Western.

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For
Best
Results

Personal Mention

General

PEDRO C. MORALES has been appointed general superintendent of motive power and machinery of the National Railways of Mexico, with headquarters at Mexico City, D. F.

FREDERICK T. H. JAMES, master mechanic of the Morris and Essex division of the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J., has been appointed assistant to chief of motive power, with headquarters at Scranton, Pa. Mr. James was born on March 16, 1894, at

Frederick T. H. James

Buffalo, N. Y. He attended the public schools and studied machine shop practice at the Y. M. C. A., Buffalo. Following a business college course, he entered civil service. From 1906 to 1909 he served an apprenticeship and in September, 1909, became an enginehouse utility worker on the Lackawanna at East Buffalo. For some months in 1911, Mr. James was assigned to the master mechanic's office in connection with the compilation of special locomotive performance reports, later being promoted to coal-chute foreman at the East Buffalo enginehouse, and then acting as a machinist at the East Buffalo locomotive shop. He became general foreman at Groveland, N. Y., in October, 1915, and erecting shop foreman at East Buffalo in February, 1918. He then served in various positions until February, 1923, when he was assigned to the Buffalo division as special locomotive and boiler inspector. On November 1, 1923, he was transferred to Binghamton, N. Y., as day enginehouse foreman and on February 18, 1924, was promoted to general foreman at the Kingsland N. J., locomotive shop. Mr. James became master mechanic of the Morris and Essex division in May, 1939.

B. V. JOHNSON, assistant master mechanic on the Los Angeles division of the Union Pacific, has been appointed maintenance supervisor—Diesel motive power, a newly created position, with headquarters at Omaha, Neb. Mr. Johnson will have general supervision over the maintenance of Diesel switching locomotives at Omaha.

PEDRO ANGELINI has been appointed assistant general superintendent of motive power and machinery of the National Railways of Mexico, with headquarters at Mexico City, D. F.

Master Mechanics and Road Foremen

C. F. DENO, division master mechanic on the Canadian Pacific at Winnipeg, Man., has been appointed master mechanic of the Manitoba district, with the same headquarters, succeeding W. J. Renix, who retired on May 31.

G. C. BOGART has been appointed assistant master mechanic of the Southern Pacific Company (Pacific Lines), Shasta district, Sacramento Division, with headquarters at Dunsmuir, Calif.

ARTHUR H. FIEDLER, who has been appointed general master mechanic, Eastern district (Lines east of Livingston, Mont.), of the Northern Pacific, with headquarters at St. Paul, Minn., as announced in the May issue, was born on January 24, 1884,

A. H. Fiedler

at Fargo, Mont. He attended high school at Butte, Mont., graduating in 1902. On June 3, 1903, he became storeroom clerk on the Northern Pacific. From September, 1904, until September, 1907, he was a locomotive fireman. From the latter date until May, 1934, he served as a locomotive engineer, becoming road foreman of engines in May, 1934, and master mechanic in February, 1939, which position he held at the time of his recent appointment.

Car Department

L. E. HILSABECK, general car inspector of the Chicago Great Western, who has been appointed to fill the newly created position of assistant superintendent of the car department, with headquarters as before at Oelwein, Iowa, as noted in the April issue, was born on November 4, 1897, at Marshalltown, Iowa. In 1915, he was graduated from high school at Seattle, Wash., and during the next year attended Oberlin College. During the summer vacation of 1915 he served as a car repair helper on the Chicago Great Western. In April, 1917, he enlisted in the U. S. Navy, and on September 19, 1919, returned to the Oelwein shops of the Chicago Great West-

L. E. Hilsabeck

ern and served successively as A. R. A. clerk, piecework inspector, and contract shop inspector of new equipment. In January, 1930, he was appointed inspector foreman at the Oelwein freight and passenger terminal and in July, 1931, became car foreman, Oelwein Terminal. Mr. Hilsabeck was appointed general car inspector in charge of freight and passenger cars in April, 1936.

JAMES PURCELL, foreman of the car department of the Morris and Essex division of the Delaware, Lackawanna & Western, has been appointed master mechanic of the

J. Purcell

division, with headquarters at Hoboken, N. J. Mr. Purcell was born on July 18, 1896, in Passaic, N. J. He attended both the public and high schools of Passaic, entering the employ of the D. L. & W. on May 2, 1913, as a machinist apprentice at Kingsland, N. J., where he later became a machinist. He entered the service of the U. S. Army in 1917 and in 1919, after 22

(*Turn to third left-hand page*)

SIX MEN

MOVE 679,768 POUND LOCOMOTIVE EQUIPPED WITH TIMKEN BEARINGS

Tapered Roller TIMKEN BEARING EQUIPPED

Freight locomotive No. 2540 of the Illinois Central System recently had its driving axle, engine truck and trailer friction bearings replaced with TIMKEN Bearings at the railroad's Paducah shops.

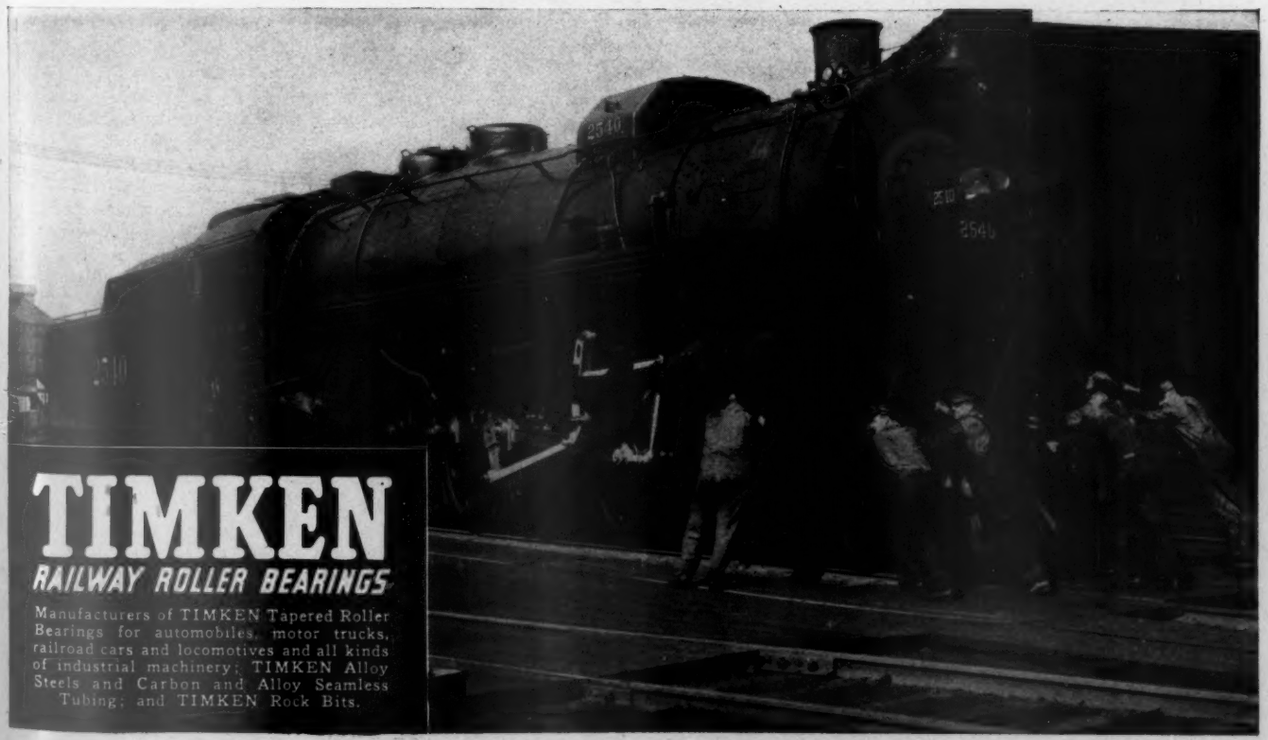
After this anti-friction treatment 6 men were able to roll the engine and tender—in working order—along a level piece of track with comparative ease.

It's a foregone conclusion that No. 2540 will be able to haul heavier loads, will possess greater availability for service, use less fuel and cost much less for maintenance now it is equipped with roller bearings.

The locomotive has been assigned to the Illinois Central's crack freighter MS-1 operating overnight between Chicago and Memphis.

Put your new and existing motive power on TIMKEN Bearings and enjoy the benefits of anti-frictionization.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



TIMKEN
RAILWAY ROLLER BEARINGS

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

months in France, returned to the D. L. & W. as a machinist at the Hoboken enginehouse. He became a supervisor in 1923; in 1930 supervisor, electrical repair and maintenance shop, electrified suburban territory, and in 1939 foreman, car department, Morris & Essex division.

C. W. GRAHAM, car shop superintendent of the Wabash, who has been appointed assistant superintendent of the car department, with headquarters as before at Decatur, Ill., as announced in the May issue, was born at Athens, Ohio, on September 16, 1884, and entered railway service in January, 1907, as a switchman on the Hocking Valley (now part of the Chesapeake & Ohio) at Nelsonville, Ohio. In 1908 he entered the employ of the Michigan Central as a car repairer and was later promoted to general car foreman at Sag-

Charles Wesley Graham

inaw, Mich. In July, 1910, Mr. Graham went to Saginaw, Mich., as chief car inspector of the Pere Marquette and a year later became general freight-car foreman of the Missouri-Kansas-Texas at Sedalia, Mo. He returned to the Pere Marquette in August, 1915, as division general car foreman at St. Thomas, Ont., and in March, 1916, went to Muskogee, Okla., as master car builder of the Kansas, Oklahoma & Gulf. In September, 1920, he went with the Wabash as general car foreman at St. Louis, Mo., and later served as division general car foreman at Moberly, Mo., and Ft. Wayne, Ind. In the latter part of 1933, Mr. Graham was appointed car-shop superintendent, with headquarters at Decatur.

O. A. WALLACE has been appointed superintendent of the car department of the Atlantic Coast Line, with headquarters at Wilmington, N. C.

Shop and Enginehouse

G. LAMBERG, shop superintendent of the Chicago, Milwaukee, St. Paul & Pacific, at Minneapolis, Minn., has retired.

C. L. SPARKS has been appointed general foreman of the Southern Pacific Company (Pacific Lines), Shasta district, with headquarters at Dunsmuir, Calif.

S. C. SELBY has been appointed day enginehouse foreman of the Southern Pacific Company (Pacific Lines), with headquarters at Klamath Falls, Ore.

F. A. LONGO has been appointed general boiler inspector on the Southern Pacific, with headquarters at San Francisco, Calif.

I. W. MARTIN, general foreman locomotive shops of the New York Central, west of Buffalo, at Collinwood, Ohio, has been appointed superintendent of shop with headquarters at West Albany, N. Y., locomotive shop.

HENRY M. SHERRARD, who has been appointed superintendent of shops on the Baltimore & Ohio, with headquarters at Glenwood, Pa., as noted in the June issue of the *Railway Mechanical Engineer*, was born on April 28, 1888. He attended grade and high schools and entered railroad service on March 3, 1903, as a messenger in the office of the superintendent of motive power of the B. & O. In April of the same year, Mr. Sherrard became a machinist apprentice. From 1907 to 1915, he was a machinist at Newark, Ohio. He was piecework inspector at Newark for a period of one year, and in 1916 became assistant machine shop foreman. In 1918, he became machine shop and general fore-

H. M. Sherrard

man and in 1925 was transferred to Glenwood (Pittsburgh), Pa., as general machine shop foreman. In May, 1930, he became motive-power inspector of the Western Lines and on December 21, 1937, was appointed master mechanic at Grafton, W. Va., which position he held at the time of his recent appointment.

Obituary

PAUL H. MITCHELL, superintendent of the car department of the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa., died suddenly on June 14, at the age of 52. Mr. Mitchell was born on February 23, 1889, at Prescott, Ark., and entered railroad service on June 1, 1907, in the car department of the St. Louis-San Francisco, where he served until June, 1908. From August 1, 1908, to July 1, 1910, he was car repairer on the Prescott & North Western. He became car inspector on August 1, 1910, on the Memphis, Dallas & Gulf at Nashville, Ark., on January 1, 1912, was appointed inspector on the latter road and was subsequently promoted to general inspector. On August 7, 1916, he became air-brake inspector and Baker heater man with the San Antonio,

P. H. Mitchell

Uvalde & Gulf. He became general foreman and master car builder on the Memphis, Dallas & Gulf on February 4, 1917, and four years later entered the employ of the Texas & Pacific as general car inspector. Mr. Mitchell entered the service of the Lackawanna on April 4, 1936, as general car inspector and two years later was appointed master car builder. On October 16, 1939, he became superintendent of the car department.

JOHN ERHARDT MUHLFELD, consulting engineer and leader in the development and design of motive power and rolling stock, died on June 19 at Harkness Pavilion, New York, of a heart attack, after an illness of two weeks, at the age of 68. Mr. Muhlfeld was born at Peru, Ind., on September 18, 1872, and entered railroad service during the summer of 1890. After serving in various capacities on the Wabash and its predecessors, and with Canadian roads, he entered the service of the Baltimore & Ohio in 1902, serving successively as assistant to general superintendent motive power, superintendent motive power and general superintendent motive power. From 1910 to 1912 Mr. Muhlfeld was vice-president and general manager in charge of reconstruction, Kansas City Southern, at Kansas City, Mo. During 1912 and 1913 he investigated steam railway practices in European countries, and since the latter year has been a consulting engineer, with offices at New York. Mr. Muhlfeld was the author of many papers on various phases of railway operation and management published in railway, scientific and technical journals. His principal activities included railway improvement, rehabilitation, valuation and development of railway motive power, rolling stock, shop machinery, tool and power-plant equipment, etc. During the first World War he developed the use of powdered coal as substitute for fuel oil in marine service.